SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLV.—No. 19. [NEW SERIES.] NEW YORK, NOVEMBER 5, 1881. [$3.20 per Annum. [POSTAGE PREPAID.]

THE OHIO RIVER.

The great drought of the past summer has had a much more depressing effect upon Western river commerce than ever before known, especially along the Ohio, upon which stream there has been an almost total suspension of steamboat traffic. During about two months of every year the river generally dwindles down to a mere semblance of its usual self, and the large steamers lie up, while a smaller class of light draught vessels continue the business. During the present season, however, the river has been lower than for nearly fifty years, and even the customary low-water packets have been obliged to cease running, and the mails and passengers are carried by a few tiny craft, drawing from 12 to 18 inches with cargo aboard. On a larger portion of the Upper Ohio no attempt to navigate the river is made.

At Cincinnati there is but *two feet* of water in the channel, and the small boys wade across at the levee, which in a good stage of the river is a bustling scene of activity, with scores of steamers moored at its edge, and the unscrupulous urchins on the Covington shore now toss stones through the deserted doors of the great floating docks on the opposite side. Above the city, dozens of large steamers are lying idle, among them big 1,500 and 2,000 ton New Orleans packets—a striking contrast to the brook-like stream they barely float in. The novel sight of a steamboat whistling for an ox team to "clear the track"—an actual occurrence recently—a steamer's crew in the yawl hunting for the deepest water, and other scenes along the river are depicted in our engraving, surrounding a view of the harbor at Cincinnati, sketched at the lowest period.

It is impossible for one at a distance to appreciate the effect of prolonged low water upon the vast region largely dependent on the Ohio River for all commercial activity. The river drains an area of more than two hundred thousand square miles, and from Pittsburg to its mouth is nearly a thousand miles in length. The numerous towns and cities on its banks, and to a large extent the interior country also, are supplied with coal and lumber from Pennsylvania; and to them low water means not merely diminished facilities for getting products to market, but a cutting off of fuel supplies and a general arrest of manufacturing industry, with a prospect of a fuel famine when winter sets in. To a large extent the Lower Mississippi region is supplied with coal floated down the Ohio in immense rafts of barges, and shares with the Ohio Valley the dearth of fuel incident to suspended navigation in the summer and fall.

It is not unusual for the water of the Ohio to become scanty during the summer, but a deficiency so great and so protracted as has been experienced this year, or anything like it, is happily rare.

For the first three hundred miles from Pittsburg the river is about 1,200 feet wide at high water, and at low water should be about 1,000 feet wide; with extreme low water this width is seriously infringed by sand bars. Below Cincinnati the width of the river increases until near its mouth it is 3,000 feet. The depth varies enormously, the range between high and low water being 60 feet or more. The usual range throughout the length of the river is 45 feet.

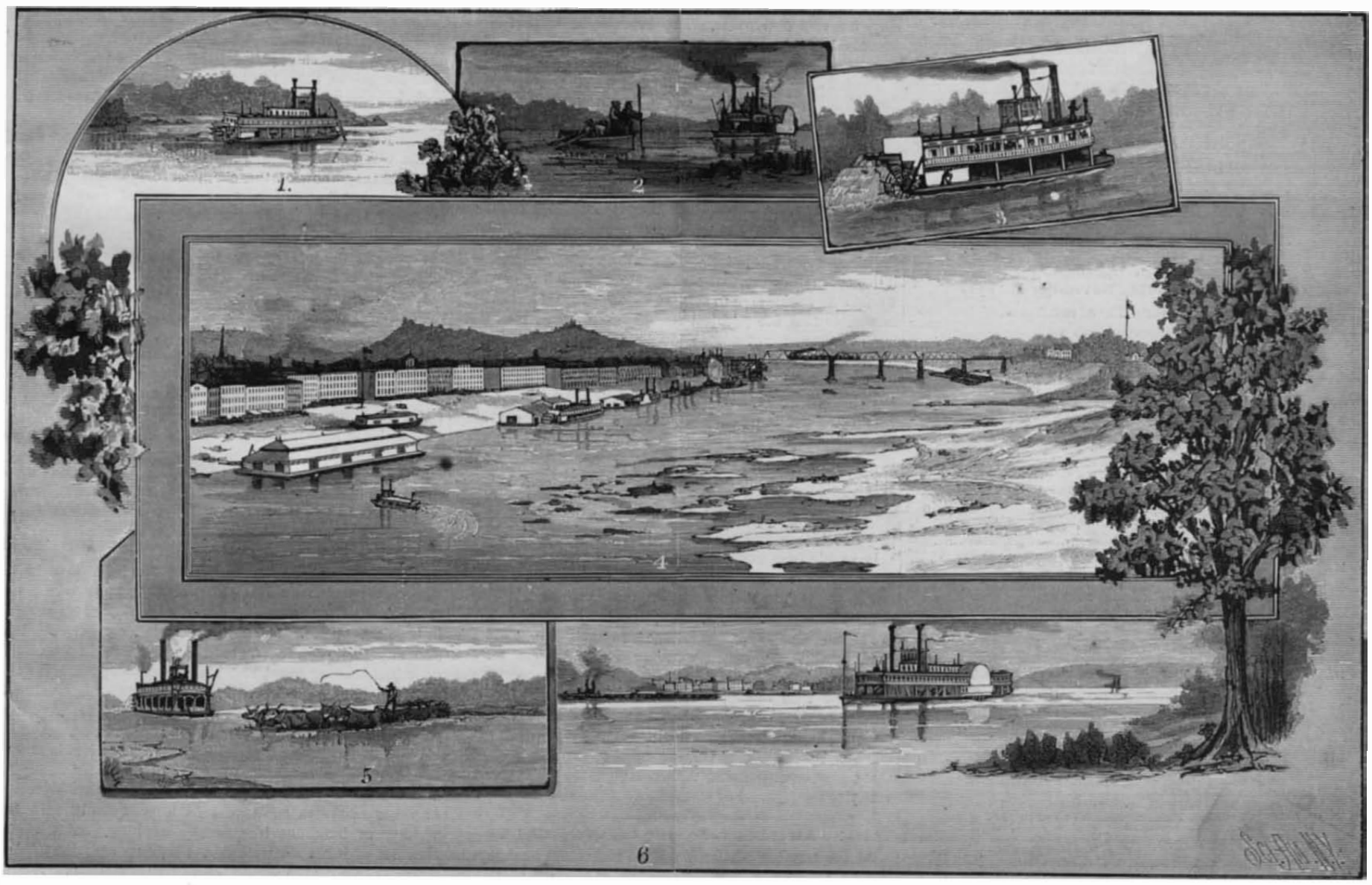
Our sketches are from the pencil of our artist contributor, Mr. H. L. Bridwell, and are drawn with much spirit. 1. A steamer hard aground. 2. Hunting the channel. The steamer's yawl is sent out ahead to pole the deepest places. 3. A low water boat at full speed, water 24 inches deep. 4. View at Cincinnati, looking up the river from the Suspension Bridge. 5. Steamer whistling for ox team to get out of the way. 6. Scene on the Ohio at the usual stage of the water.

The Poison of Human Saliva.

Recent observations by M. Gautier (communicated to the Paris Académie de Médecine) afford reason for believing that the poison of serpents differs from human saliva in the intensity of its effects rather than in essential nature, so that the fears with which a human bite is often regarded may not be wholly unreasonable. M. Gautier took some 20 grammes of human saliva, and, after lixiviating and purifying, obtained a substance which, injected in the form of solution under the skin of a bird, had remarkable toxical effects. Almost immediately the bird was seized with trembling. It staggered and fell to the ground in a state of coma and complete stupor, terminated by death in half an hour or an hour, according to the dose injected and the vigor of the animal. The phenomena resembled fully those produced by the bite of a venomous serpent. The poisonous matter of the saliva is thought to be an alkaloid similar to the cadaveric poisons called *ptomaines*, which MM. Brouardel and Boutmy have isolated. Like them, it produces Prussian blue when mixed with ferrocyanide of potassium. The facts stated throw some light on the question of virulent maladies. The present case, it is pointed out, is not that of a true virus; for at high temperatures a virus is destroyed, but when the salivary alkaloid is heated to more than 100° its poisonous property is not affected. M. Gautier studied comparatively the poison of the cobra (one of the most formidable of Indian serpents). This injected, in a dose of one milligramme in a quarter of a cubic centimeter of water, under the skin of a small bird, such as a chaffinch or a sparrow, kills it in five to twelve minutes. One observes torpor and coma, then a period of excitation, with convulsions and tetanic contraction. In connection with the subject, a correspondent of *La Nature* calls attention to a passage of Rabelais in which the poisonous nature of human saliva is recognized.

Postal Statistics.

The annual report of the Superintendent of the Free Delivery Division of the Post Office Department for the year ended June 30, shows that during the year there were delivered 262,425,668 mail letters, 59,968,559 mail postal cards, 76,733,208 local letters, 43,898,158 local postal cards, 2,126,309 registered letters, and 146,417,114 newspapers. There was collected at the 109 free delivery offices during the year 284,759,945 letters, 85,793,125 postal cards, and 54,075,476 newspapers. The cost of the service for the year amounted to $2,493,972.14, or 3 mills per piece.



1. Hard aground.—2. Hunting the channel.—3. The low-water boat.—4. The Ohio at Cincinnati, looking up the river from Suspension Bridge.—5. Steamer whistling for oxen to clear the channel. 6. Scenes on the Ohio at the usual stage of water.

LOW WATER SCENES ALONG THE OHIO RIVER.—DRAWN BY H. L. BRIDWELL.

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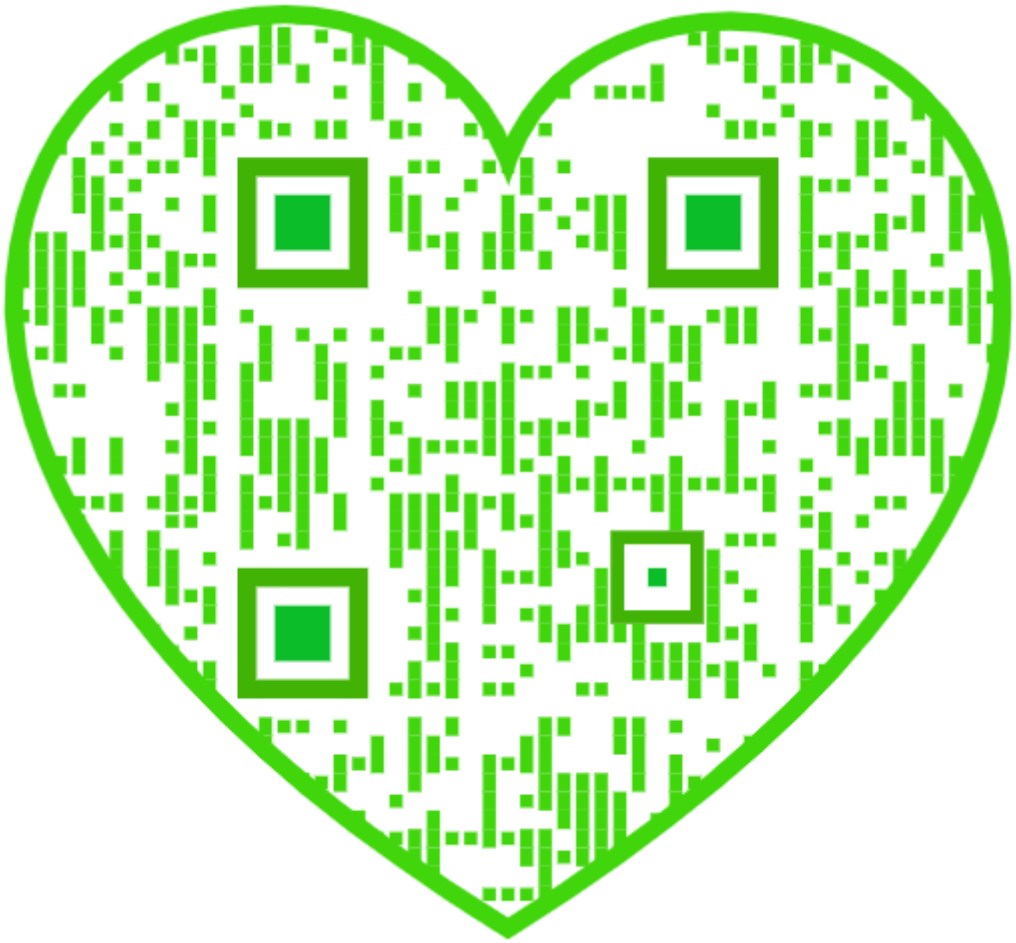

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, NOVEMBER 5, 1881.

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THE FONTAINE LOCOMOTIVE.

In the SCIENTIFIC AMERICAN of October 8 there was given a large engraving of No. 1 of the new type of locomotive engine designed by Mr. Eugene Fontaine, with a brief account of its peculiarities. In the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT will be found a corresponding illustration of the Fontaine locomotive, No. 3, recently completed, with critical estimates of the value of the improvements introduced by the inventor. There is given also a sufficiently full statement of the behavior of these engines to enable the reader to form an idea of the reasonableness of the high expectation which the friends of the new plan of locomotive construction entertain with regard to the advantages it involves. The SUPPLEMENT paper referred to, it is proper to say here, is by Mr. John Ortton, Mechanical Superintendent of the Canada Southern Railway, under whose direction engine No. 1 has been running for several months. The high professional standing of Mr. Ortton gives weight to the judgment which he expresses—a judgment based on a critical study of the theory of the inventor as well as the practical behavior of the engine.

From the evidence thus furnished it seems to be abundantly established that the Fontaine locomotive marks a long stride forward in the direction of speed and economy in railway service. If it is not, as its friends confidently believe, the most important improvement made for many years in the construction of locomotive engines, it is still one that cannot fail to give a notable impetus to the advancement of railway engineering and to the social and commercial changes incident to increased facilities for rapid transit.

The distinctive mechanical features of the new engine have been sufficiently dwelt upon in the articles already mentioned. It is enough in this place to say that, by a bold and ingenious change in the manner of applying the power through auxiliary drivers, a large increase of speed is obtained with a given size of driving wheel without increasing the number of piston strokes or the amount of fuel consumed. Or, the speed of the train being constant, the improved method of applying the power and the more complete development of the working force of the steam enable the engine to haul a much heavier load than is possible with the engines in common use. Theoretically the advantage gained is nearly eighty per cent in speed or traction above the best performance of engines of the same size, built in the prevailing style—a practical gain of 30 per cent is deemed well within the bounds of demonstration.

The dimensions of engine No. 2, designed for freight service but not yet built, are given in the SUPPLEMENT.

The new engine (No. 3) has not yet been tested for speed. No. 1 has developed a speed approaching seventy miles an hour over long distances. In May last it drew a light special train from Amherstburg to St. Thomas, on the Canada Southern Road, a distance of one hundred and eleven miles, in ninety-eight minutes. The run from Amherstburg to Buffalo, two hundred and thirty-five miles, was made in two hundred and thirty-five minutes, including stops for coal and water. The expectation is that No. 3 will make ninety miles an hour, in which case it will be placed on the road between Jersey City and Philadelphia.

The influence upon commercial and social life certain to flow from an improvement like this—which greatly cheapens the cost of power for hauling freight and passengers—it is impossible to estimate. Social and commercial activity increases not in simple but in compound ratio with each step in the mastery of time and space, and in every instance hitherto the results of such improvements have surpassed expectation.

For ages men have envied the ability of birds to cleave the air at a speed approaching a hundred miles an hour, and it has been thought that nothing short of a flying machine would ever enable men to achieve a transit so rapid. It seems incredible that the problem should be solved without leaving the ground, yet not so incredible, nor half as improbable, as a speed of fifty miles an hour seemed to engineers fifty years ago.

There are few existing railways, it is true, on which it would be possible or prudent to drive a train at anything like the speed expected of the Fontaine locomotives, owing to the instability of the road-beds and the sharpness of the curves. But the improvement of established roads is being rapidly carried out, wherever the service requires it, and we may be sure that any degree of excellence which the future may demand will be promptly supplied.

But aside from any consideration of increased speed, the new locomotive (if experience shall confirm the promise held out by the performance of the engines now on trial), will materially increase the economy of railway service. There are already something like a hundred thousand miles of railroad in this country, employing not far from twenty thousand engines. All our great locomotive works are burdened with orders, some having contracts which will require two or three years of constant work to fill. Obviously an improvement which will add thirty per cent. to the efficiency of the locomotive, the running expense being the same, has the capacity of adding millions to the value and vastly to the capacity of our railway systems.

No Award in the Cattle Car Competition.

At the meeting of the American Humane Association in Boston, October 19, President Brown announced that there was no award by the judges of the $5,000 prize offered last year for an improved cattle car. Seven hundred designs and models had been submitted to the committee, but no one of them so complied with the conditions as to win the prize. Evidently the owners of good cattle car patents hold them at a higher figure that $5,000.

CASUALTIES IN BLASTING.

The introduction of the new blasting powders, especially those of which nitro glycerine is the basis, has given rise to many novel questions upon the responsibility for accidents. The workmen employed in engineering, quarrying, or mining operations, often disregard proper precautions simply because they do not know the nature and dangers of the explosives furnished for their use. This ignorance on the part of laborers, although natural and unavoidable, is the cause of many disasters. Gunpowder, formerly the only blasting agent used, has become quite well known to the common people. For more than a century the Fourth of July has been practically devoted to instructing the boys of the land that fire and gunpowder must absolutely be kept separate unless an explosion be desired. Thousands of casualties have re-enforced the lesson upon the minds of grown men in all the walks of life. What fact is better known than this, even among persons the least instructed? Quite otherwise as to the modern blasting powders. They have been so recently invented, are of so many kinds, and are in use under so many names, that no one should expect ordinary laborers to be fully acquainted with them all. Again, gunpowder can be fired only by an actual spark; if such a thing be possible as that it should be exploded by a blow, this could only occur under extraordinary circumstances, enabling the blow to heat the powder to the point of ignition. But, as all readers know, nitro-glycerine and its compounds, as well as some other agents somewhat used in blasting, may be exploded by concussion merely—the ordinary stroke of a hammer, the dropping of the can upon a floor or rock; and this concussion is believed to operate not at all by raising the temperature of the substance to the point where it will ignite, but, in some way not very well understood, by the change it introduces in the relation or position of the chemical constituents. The average laborer, though trained to recognize gunpowder and to guard it most carefully from every form of fire, does not equally know the blasting powders, either by sight or by their multitudinous names; nor does he realize that careless handling, an unlucky rub or stroke, may be to them what the spark is to the powder.

What once happened on a Boston railroad is a good illustration. Some one having work in hand involving blasting wrote to manufacturers of dualin for a quantity of that explosive, and to another manufacturer for a number of the exploders or detonators commonly used in firing it. It is a peculiarity of nitro-glycerine (also of gun cotton) that if a small quantity lying loose be touched with a match it will burn quietly; but if a blow be given to it an explosion will follow; and if the suddenness and violence of this blow be made as great as possible, which may conveniently be done by exploding some one of the fulminates in contact with the nitro-glycerine, the explosive power of the latter is raised to the maximum. Hence the use of exploders in connection with dualin. In the Boston accident the manufacturers of the dualin sent it, in cases plainly labeled, to the railroad depot to be carried to the customer. The manufacturer of the exploders sent those to the same depot; they also were labeled. Unfortunately both parcels reached the depot at the same time. Now this occurred ten or twelve years ago, when dualin was a novelty. The train hands saw the labels; but what did they know of the character of "dualin," the use of "exploders," or the peculiar danger of packing them together? And what did they do but put the two parcels side by side in the same freight car! The natural jolting of the car upon the journey fired the explosives and great mischief was done. Evidently such disasters are attributable not to carelessness in a strict sense, but to ignorance inseparable from the introduction of a novel and dangerous agent.

Recent books of court reports contain several cases illustrating the duties of those who furnish these powerful agents to untaught workmen. It is worth an employer's while to know that his obtaining leave from the public authorities to have a dangerous piece of blasting done does not diminish his responsibility for any disastrous consequences. There are rules of law limiting the right to keep explosives in store; and cities usually have somewhat stringent ordinances on the subject. When the Delaware, Lackawanna and Western Railroad Company constructed its tunnel through Bergen Hill it sought and obtained, in addition to the general authority given by the legislature in its charter, a specific license from Jersey City, in which the eastern end of the tunnel lay, to store the explosives needful in blasting. Under this twofold permission from the State and city their contractor built a magazine in which he deposited blasting powders. These exploded, damaging the adjoining houses. On behalf of the contractor it was shown that the magazine was built and the explosives kept in a most careful manner; no precaution was omitted. And he claimed that as he got leave to keep the explosives in stock, and kept them carefully, he was not liable for damages. The court said, in effect, that the keeping of nitro-glycerine or other explosive substances in large quantities in the vicinity of buildings is, generally speaking, unlawful; in New Jersey it is a misdemeanor. Getting permission to keep it simply relieves the person from this prohibition. It does not exempt him from damages if his dangerous goods explode. Whoever for his own profit stores these things in a city, must not only get leave, but also bear the entire risk.

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Quite like this is a late New York decision relative to gunpowder kept in a fireworks factory.

The courts are holding that whoever, as employer, is conducting blasting operations owes to his workmen the legal duty of providing safe materials and apparatus, and of instructing the men adequately in the perils involved and the precautions proper. He must tell the men what they are using and how it should be used. This is common sense; it is likewise law. It is well illustrated by a California decision rendered last year in a suit against a quartz mining company. The company in its first blasting operations used gunpowder; but afterward the management adopted Excelsior powder in its place. Yet the workmen continued the practice of tamping the charge with an iron bar. One day there was a premature explosion, and the workman was badly hurt. He sued the company for damages, complaining that Excelsior powder was too dangerous to be used in mines; and that at least a wooden bar ought to be furnished for tamping, and special instructions given, neither of which things had been done. The court told the jury that the proprietors of such works have a right to introduce a more effective powder, though it be more dangerous, provided it is one which experiments and judicious tests have shown to be ordinarily suitable for blasting. But they are bound to furnish any apparatus needful for using the new powder safely; if the cause of the disaster was that a wooden bar was needful and was not supplied, the company was liable for the workman's hurts. And they are bound to give the men judicious explanations and instructions, according to the novelty of the agent; hence if the disaster was fairly attributable to the neglect of the foreman to tell the hands of the change in the powder and the danger of using an iron bar, the company was liable. Upon the other hand workmen who accept employment in blasting take the risk which is inseparable from the business. Even if the risk is increased by introducing a more dangerous powder, the workman, by continuing his service after he has been fairly informed of the change and the danger, agrees, as the law views the matter, to take the additional risks. He is even considered as agreeing to take the risk of any carelessness on the part of his fellow workmen. He is also debarred from claiming damages if he was negligent; thus if this complainant knew from any source that it was imprudent to tamp with an iron bar he ought to have declined to do so.

A similar decision was rendered in New Jersey, last November, in favor of a miner in the employ of the Oxford Iron Company. The president and general superintendent introduced giant powder as a substitute for gunpowder, without giving the men information of the change and the new precautions they would need to use; and an explosion occurred which blinded a workman for life. The court said that he ought to have damages. By hiring himself to the company for duty in blasting he took the risks necessary in that dangerous business, including risk that his fellow workmen might be careless. But he did not agree that a novel and highly dangerous explosive might be substituted without warning to him. The company was bound, when introducing the giant powder in its work, to make known to the men its properties and the right mode of using it. To furnish such an article for a laborer's use without giving him the information, is gross negligence on the part of an employer; and whether the employer or company knows the danger and omits to disclose it, or furnishes the article without knowledge of the danger, makes no difference. The president represented the company in introducing the new powder; and as he clearly neglected the duty of instructing the men, the company must pay damages.

OYSTER NOTES.

One hundred and fifty years ago there were four thousand oyster women in Paris, who pursued their business with much zeal and dexterity.

The "green" oyster, so much prized in France, will not sell in our markets. The "greening" of oysters is extensively carried on at Marennes, on the banks of the river Seudre; and this particular branch of oyster industry extends for leagues along the river, and is also sanctioned by free grants from the State. The peculiar color and taste are said to be imparted by the vegetable substances which grow in the beds where the oysters are cultivated.

A resident of London, England, claims that that city spends over $25,000,000 a year for oysters, and that more than twice the number of these bivalves would be used if they could be obtained at as reasonable prices as in America. The genuine Whitestable oyster fetches about seventy-five or eighty cents a dozen. Oyster culture in England is yet in its infancy. Large numbers of oysters are now carried to England from this country. The most popular size for eating is in a shell about as large as a dollar. They are packed in barrels very closely and kept right side up during the voyage. Quite a trade is now springing up in carrying "seed" oysters to Europe.

Car loads of oysters are shipped to California from New York every few days. The "native" oyster of that western coast is obtained in the Gulf of California, and is small and of coppery taste. There is as wide a contrast between the California bivalve and the Eastern as between a crab-apple and a Rhode Island greening. Something of a supply is being obtained on the Oregon or Washington Territory coast. These are better than the more southern.

The seaboards of Georgia, South Carolina, and Texas abound in oysters. In some places they have grown up into reefs extending for twenty miles along the coast. Much of this oyster wealth may yet become available for Northern markets. Various river mouths and estuaries along the Connecticut and New York shores would be most excellent oyster farms, if some means could be provided to keep the deposits of mud from covering and smothering the young oysters. The time may be near when enterprising men will seek to clear off these ruinous deposits as they now drain marshes and fill up swamps and pools. The recent law of Connecticut creating a State Commission to sell the deep water ground of the Sound, has served to inspire great activity in securing farms in the sea. Many thousands of dollars have already been realized for grounds appropriated.

The production of oysters has more than doubled in quantity in and about New York Harbor, Staten Island, and Perth Amboy during the past five years. It is believed if the mud could be kept out of New York Harbor it would make one of the finest oyster beds in the world.

The natural oyster beds on the east side of Staten Island are the places whence much of the "seed" for all the various famous kinds of oysters about New York is obtained.

It is believed by some that every evil has its antidote. Every pest, sooner or later, can be met by something that will subdue or check it. The potato bug ravaged a few years, and then Paris green came into use, so that they are no longer feared. He would be a benefactor indeed who should discover some cheap and efficient means of stopping the ravages of "stars" and "drills" on oyster beds. Every oyster cultivator says: "Tell us, if possible, how to fight these pests." Here is a field for a scientific scholar. So far it seems to be understood that stars find their homes and breeding places among rocks and reefs. They move out from these upon oyster beds. It has been discovered that dead "stars" are a good means of enriching land. They are capital things to put on the garden. They ruin oyster beds, but enrich vegetable beds. Professor Verrill, of Yale College, says the "star" takes the small oysters into his stomach whole, shell and all; but the larger ones he kills before eating. He does this by surrounding the oyster with the lobes and folds of his enormous saccular stomach. The gastric juice from it is infused into the shell and kills the oyster, so that the bivalve opens and is soon consumed by the rapacious "five finger." The only way yet discovered to destroy this enemy is to dredge them off the beds and throw them on the land.

Science has demonstrated that oysters can be so managed that their spawning seasons can be regulated, and thus good oysters be had and eaten every week in the year. This is arranged in the Connecticut waters by planting them in different depths of water. This secures variety in temperature. The greater the heat the earlier the oysters will spawn. Therefore by moving them into shoal water in a sheltered place where the sun will warm the water easily the spawning season will be over in early summer. Those in the deeper and colder water will, of course, feel the heat later, and therefore spawn later. Thus one portion of the oyster supply can be always ready for use.

STEAM BOILER NOTES.

The boiler of J. J. Cornish's saw mill, near Richmondsville, ten miles northwest of Port Sanilac, Mich., exploded at 4 o'clock P.M., October 6, instantly killing Fred. H. Diehm, who was acting as engineer. The top piece of the south end blew out, striking Diehm, who was standing directly in front, knocking him about ten feet, breaking his neck, bruising his face, and scalding his body above the waist. The owner of this mill made a statement which runs thus: "About half an hour before the disaster I went to see to the boiler and engine, and found them working all right. I told Diehm he must put on the injector about ten minutes, but don't know whether he did or not. Just before the explosion he stopped to oil up and I did some oiling around the saw. Diehm said to me, 'Are you ready?' I said, 'Just about.' He said, 'Hurry up.' I said, 'All right; go ahead,' and looked up. I put my hand on the saw lever, ready for work, and saw him go to the globe valve to turn on the steam. The steam gauge was facing me, and, as I looked up, I glanced at the gauge and saw that it registered sixty-five pounds only. Before the engine had started I saw dust and steam and flying brick, and then heard a deafening report. I knew at once that the boiler had exploded, and ran to where Diehm stood; did not find him, and looked around, but did not see him nor hear him. I thought he was killed. Ten or fifteen feet away to the south, and directly in front of the boiler, the body lay on its face. I never saw him move. I was hit with pieces of brick, but not injured at all. The boiler was stationary, set with brick, and was bought second hand of Bruno Gunt last spring. When bought it tested 200 pounds, which it stood all right." The mill had been burned and rebuilt some time previous to the explosion, and when ready to start the boiler "was tested again the same as at first and stood test all right except around the dome where a number of pin holes appeared. As only sixty or seventy pounds of steam was needed it was thought to be safe. The boiler sets north and south, fronting south. The explosion took the top half of the front out, lifted it clean off the arch and threw it about twenty rods up a hill. It struck on end and turned completely over."

The boiler in Thomas Grady's shoddy dye works at Clifton Heights, Delaware County, Pa., exploded, October 10, instantly killing the engineer, Robert McClure, and wounding several other persons. James Maguire had his collar bone broken, and was sent to the Pennsylvania Hospital. The other wounded were taken to their homes. The mill was partially wrecked by the violence of the explosion, and, taking fire from the coals scattered from the furnace, was totally destroyed.

The Hamilton, Ont., *Times* has the following in relation to the thrashing machine boiler that exploded September 23, and killed Andrew Lloyd and wounded a young woman and two men besides Lloyd. "Mr. Robb, chief engineer of the Canadian Steam Users' Insurance Association, who was commissioned by the Ontario Government to examine the remains of the boiler which burst with fatal results at Thurlow, has completed his inspection, and has prepared his report. After making close examination, he reports that the boiler was evidently well kept, that it was clean, and that there are no signs that the water was allowed to run low. This is a strong point in favor of the engineer. 'The boiler burst,' he says, 'from inherent weakness, being made of poor material.' It was not provided with a first class safety valve, and the valve it has should in justice be called a danger valve."

The boiler at Major's flour mill, Colinville, Ontario, exploded at an early hour on the morning of October 11, wrecking the engine house and saw mill, and seriously scalding William and Headley Major, sons of the proprietor, and William Bickell, miller. About 6 A.M., a fire was started under the boilers, one of which was a tubular and the other a flue, and it was left unguarded while the hands were at breakfast. After breakfast the three men named above went into the engine house, and were standing close to the flue boiler when the tubular one exploded. The cause is not definitely known. The steam gauge, just previous to the explosion, registered 56 pounds. No boiler of ordinary strength, that is, retaining a proper margin over the working pressure, has ever been *known* to explode at 56 pounds per square inch; but a great many have done so at pressures not greater than that, which showed defects of such extent as to excite surprise in the minds of observers that the boiler had sustained even so much as its common load. On the other hand steam gauges do not always tell the truth; they are not only often from 10 to 50 pounds slow, but they are often cut off entirely by obstruction of mud or sediment in the pipe that communicates with the boiler. Again, they sometimes stop at a regular point above which the pointer cannot go from obstructions in the quadrant gear. In short no reliance can be placed on a boiler that is not sound and has not a perfectly reliable and well kept safety valve.

American Success at the Electric Exhibition.

In advance of the official publication of the awards at the International Exhibition of Electricity, the Paris correspondent of the *Herald* cables, October 20, the names of the successful exhibitors from this country.

As a mark of the highest distinction, diplomas of honor have been awarded to the United States Signal Office, the Smithsonian Institution, the United States Patent Office, and Messrs. Edison and Graham Bell.

Gold medals are awarded to the Anglo-American and Brush Electric Light Companies, the United States Electric Lighting Company, Elisha Gray, and Tainter.

Silver medals to Bailey & Puskas, Connolly Brothers & MacTighe, Dolbear, Eccard, Electric Purifier Company, Hubbard Pond Indicator Company, Western Electric Manufacturing Company, Weston Electric Light Company, and the Electro-Dynamic Company.

Bronze medals to Messrs. Chavet, Cumming, and Dion, the Hoosac Tunnel Company, Trinitro-Glycerine Works, Partz, Photo-Relievo Company, White House, Mills and Williams.

If the relatively small number of American exhibitors be considered it will be seen that they have carried off a very large number of prizes. The awards have been made for the *ensemble* of each exhibitor's contribution, not for any single invention exhibited, except, of course, where there was only one.

Ozone at the Electrical Exhibition.

The editor of *Les Mondes* has had a call from Dr. Tommasi, the distinguished Florentine chemist, who came to propose an idea to him that is worth publishing.

The Palace of Industry is at present a place where there is in circulation, especially during the evening, an immense quantity of electricity. Now, under the special and entirely exceptional conditions presented by this vast closed space saturated with electricity, it may be that the atmosphere undergoes peculiar modifications; for example, there may be a production of a certain amount of ozone. It would be extremely interesting, then, to put up an apparatus for collecting the ozone from the air, and which should work continuously at the exhibition. Such an apparatus was proposed by Dr. Tommasi at London seven years ago. The moment seems to us opportune to perform these curious experiments. Dr. Tommasi is all ready to undertake them, but he needs for this the concurrence of some of our learned professors and the kind co-operation of the commissariat of the Electrical Exhibition. We trust that neither will be lacking. Should these experiments take place we will inform our readers of the results obtained.—*Chronique Industrielle.*

MAGIC MIRRORS.—The magic mirrors, which have been a good deal discussed of late, are all of metal. M. Laurent has succeeded in making them of glass, which is sufficiently elastic for the purpose.

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COMBINED ANVIL, PUNCH, AND SHEARS.

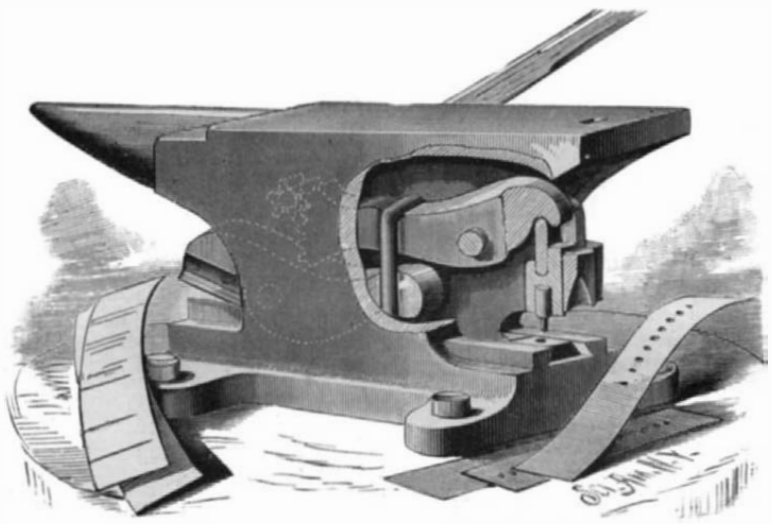
The engraving represents a novel combination of anvil, punch, and shears, recently patented by Mr H. A. Schnelkloth, of New York city. The anvil is of the usual size and shape, the shank and base portions being hollowed out to receive the shear lever which projects from one end of the anvil, and the punch lever which projects from the opposite end.

The fixed blade of the shears, as well as the female portion of the punching device, is arranged upon strong transverse base portions of the anvil, both being set into dovetailed recesses of the base. The base below the opening of the female die is provided with a hole of gradually increasing width, through which the punchings are readily dropped.

The movable blade of the shears is attached to the front end of a fulcrumed lever, the rear end of which is connected by a strong link to a fulcrumed lever which carries the male die of the punching device. The shear lever is connected by a pivot link with a vertically guided block, in which is formed the socket for the punch, this block being guided by beveled cheeks of the side walls of the anvil, and by an angular front plate.

The link serves to raise the block, while a solid piece, interposed between the block and the end of the lever, serves to press the block down so as to force down the punch. The inner end of the punch lever is provided with a toothed segment which meshes with a pinion keyed to a transverse shaft, and provided with a lever by which either the punch or shears are operated according as the lever is thrown into one direction or the other. This shaft is journaled in bearings of the side walls of the anvil, and carries at its outer end a socket frame into which the handle is inserted and clamped when it is desired to operate either implement.

In this manner a handy and compact combination tool for metal workers, which serves as an anvil, punch, or shears, is obtained, which does not take up more space than a common anvil, and dispenses with separate punching and shearing implements.



COMBINED ANVIL PUNCH AND SHEARS.

The Area of Louisiana.

The United States Land Office makes the area of Louisiana to be 41,346 square miles. Prof. Hilgard, in a census report lately published, puts the figures at 45,430 square miles. The difference is one of 2,607,300 acres. It is more than the combined area of Rhode Island and Delaware. An examination of the State by parishes shows a considerable excess in land over that reported by the Land Office. There are 1,242 complete townships in the State, amounting to 44,712 square miles, besides fractions of others, showing an excess of 3,500 square miles on the lowest calculation. Prof. Hilgard, of the Census Bureau, writes to the New Orleans *Democrat* that he has gone over the figures carefully with the geographer of the bureau, Mr. Gannert, and both are convinced that the Land Office report is wrong. They imagine that the first United States survey found 44,346 square miles; that the second "4" was transcribed as a "1," and that the error has been carried down from year to year, and from book to book, until the erroneous figures have found their way into all the standard authorities.

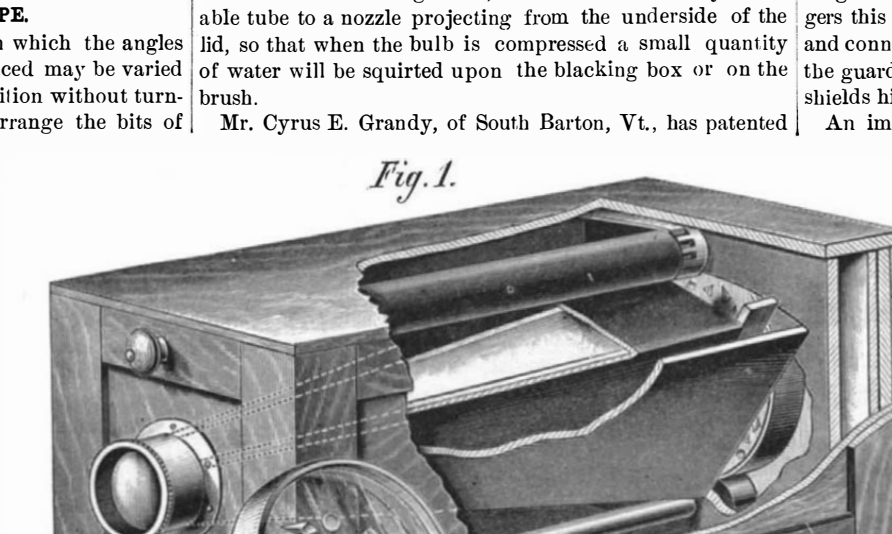
IMPROVED KALEIDOSCOPE.

The engraving shows a kaleidoscope in which the angles of the reflectors and of the figures produced may be varied at will and held fixed in any desired position without turning the instrument, and to design and arrange the bits of glass or other material whose change in position gives rise to the figures of the kaleidoscope, so that when viewed through the kaleidoscope tube they shall present varying tints, shades, and compounds of color and a greatly increased number and variety of figures. The case of the kaleidoscope may be of any desired shape or size.

The ground glass is set vertically in grooves in one end of the case against the inner face of the end plate, which is provided with a triangular opening. A little in rear of the end plate is a parallel vertical partition provided with a corresponding triangular opening, forming the pocket for the reception of the object wheels. The object wheel is made of two or more circular plates of glass held apart and parallel with each other by a hoop so as to form one or more chambers for containing bits of glass or other material for producing the figures of the kaleidoscope. When in place in the case the object wheel rests on the friction disk or wheel secured on an end of a rod which is extended longitudinally through the case along the bottom, and has a knob on its outer end for convenience in turning. By rotating this rod the object wheel is made to revolve.

The tapering reflectors in which the images are formed are centered by a wooden case, and are drawn together more or less by a roller in the upper part of the case, upon which are wound pieces of cloth attached to the edges of the glass. The cloth and roller not only answer the purpose of varying the angle of the reflectors, but they form the third side of the reflecting tube, excluding light and dust.

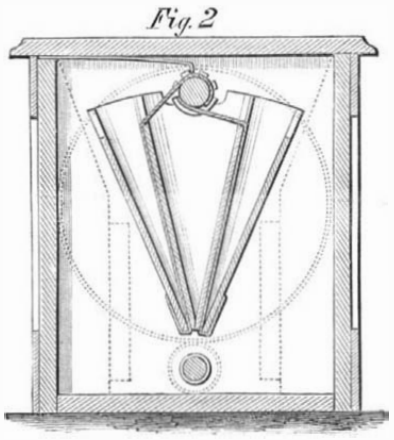
Fig. 1 is a perspective view. Fig. 2 is a transverse section. This novel device was lately patented by Mr. V. M. Farr, of Oskaloosa, Ia.



FARR'S KALEIDOSCOPE.

MECHANICAL INVENTIONS.

Mr. John H. Gwinner, of Hughesville, Pa., has patented a shoe-blacking apparatus consisting of a box provided with compartments for slippers, blacking brushes, shoe-dressing bottles, etc., the compartments being provided with swinging lids, to one of which a reversible foot rest, that can be adjusted for right or left handed persons, is attached. The lid of the box has a blacking-box holding frame pivoted to its under side, in which frame the blacking box is held by suitable thumb screws, and the lid is also provided with a rubber bulb containing water, which is conducted by a suitable tube to a nozzle projecting from the underside of the lid, so that when the bulb is compressed a small quantity of water will be squirted upon the blacking box or on the brush.



TRANSVERSE SECTION OF KALEIDOSCOPE.

Mr. Cyrus E. Grandy, of South Barton, Vt., has patented an improved machine for splitting wood for fuel and other purposes. The machine is driven by power, and is provided with a knife having concave sides which splits the wood completely at every stroke.

Mr. Arthur W. Bush, of Boulder, Col., has patented an improved watchmaker's tool. It has always been a tedious and difficult matter to set a ruby pin or pin jewel properly. The object of this invention is to provide a simple and convenient tool for overcoming this difficulty, whereby the pin may be held in an upright position with the flat side in front.

An improved lock and latch, patented by Mr. Francis Keil, of New York city, is of the class known as "front-door locks," in which the locking bolt, latch, and night latch mechanism are combined in a single case.

Mr. William T. Shaver, of Eldora, Ia., has patented an improved wagon gear especially applicable to spring wagons, the object being to provide a device whereby the usual strain upon the side springs, reach, and head block is avoided and the wagon gear is rendered more elastic.

Mr. James Nuttall, of Heap Bridge, near Bury, County of Lancaster, England, has patented an improvement in machinery for cutting pattern cards for looms. This machine, although simple, cannot be described without engravings.

An improvement in steam engines has been patented by Mr. James H. Suits, of Butler, Ill. The invention consists in the addition of a vacuum chamber to the steam cylinder, with which the cylinder communicates by means of ports corresponding with the cylinder steam ports, the vacuum chamber being supplied with a suitable valve, and being exhausted of residual air and steam by an air pump, so that the steam and air behind the piston at the end of each stroke may escape into the vacuum chamber, and thence be removed by the air pump.

The plug of an ordinary four-way cock is so constructed as to allow supply of liquid through two pipes and escape of liquid through two other pipes simultaneously, but is not adapted to cut off the flow in either direction and simultaneously allow it in the other. Mr. Jackson Sheppard, of Memphis, Tenn., has patented a four-way cock whose plug is so constructed and combined with a shell having four openings or passages that it will allow passage of liquid in either of two directions through the shell, but not in both simultaneously, and may be adjusted to cut off the flow in both directions when desired.

An improved mechanism for converting motion has been patented by Mr. William Hanna, of Gilroy, Cal. This improved mechanism is intended for use as a substitute for cranks in converting rectilinear reciprocating to continuous rotary motion, the special object being to increase the extent of rotary motion from a given length of stroke, while at the same time avoiding dead-centers.

An improvement in machines or frames for twisting fibrous materials has been patented by Mr. William Murray, of Selkirk, County of Selkirk, Scotland. The object is to give double or more twist than is usual by the ordinary machines or frames driven at the same speed and taking but little more power.

Mr. John D. Smith, of Fayetteville, N. C., has patented an improved attachment to a cotton gin, designed to prevent accidents which so often occur from the contact of the hands and arms of the operator with the saws. In reaching under the arms to brush the moats off the moat board the draught is liable to draw the sleeve up to the saws and involve the laceration or cutting off of the man's arm, and in raising the breast of the gin to clean its ribs while the saws are running the same danger is incurred. To obviate these dangers this inventor provides a guard hung beneath the saws and connected to the breast, so that when the breast is raised the guard is thrown between the saws and the operator and shields him from danger.

An improved vehicle gear has been patented by Messrs. Adam S. F. McBride and Henry D. Haisten, of Cuthbert, Ga. The object of this invention is to provide a gearing adapted to all carriages and of superior elasticity, strength, and durability.

Mr. Henry M. Loud, of Oscoda, Mich., has patented a combined matching and gluing machine, by which the matching and gluing may be performed in a single operation, and the labor and expense of constructing boxes and other articles, where tight joints are required, may be greatly diminished.

Mr. Zadok T. Blackwell, of Carrington, Mo., has patented a new pulley wheel for rope transmission, which is so constructed that the rope cannot slip. A series of pairs of clutches are pivoted to the ends of strips on the sides of a wheel, or the lower ends of these clutches may be pivoted in short notches or recesses in the edge of the wheel. The inner or adjoining edges of these clutches are curved from the base upward and outward, and are provided with shoulders or offsets which overlap each other. The driving rope passes around the wheel and rests in between the clutches and on the shoulders or directly above them. If the rope presses on the shoulders the two jaws are forced together and the rope is jammed in between the edges of the clutches and held.

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NEW INVENTIONS.

In coating wire with tin or zinc the usual method for removing the surplus tin or zinc from the wire as the latter leaves the bath, is to draw said wire through a covering of sand, asbestos, or other non-combustible substance that is placed on the surface of the bath; but in this method tubes of scoriæ are quickly formed by the passage of the wire through the sand or asbestos, so that the latter ceases to wipe off the surplus molten tin or zinc, or does so imperfectly, and when in operating upon a number of wires at a time the sand or other material about one wire becomes dirty or ineffective from scoriæ or from the surplus metal that is wiped from said wire, all the wires have to be stopped to replace the dirty with clean sand. Messrs. John A. Crich, of Naugatuck, Conn., and Frederick Crich, of Pittsburg, Pa., have patented a device free from these objections, that will rarely require the changing of the sand or other wiping substance, and that is so arranged that the sand can be removed and replaced about one wire, when desired, without interfering with the other wires.

Mr. William B. Collier, of Ellicott City, Md., has patented an improved dredging machine, more particularly designed for dredging oysters or other shellfish. This invention consists in an inclined endless rake composed in part of an endless slatted apron provided with hooked tines and passing round upper and lower drums, the former of which has its bearings in the stern of a vessel and is rotated to drive the apron, while the lower drum rests upon the water bed and is hollow and water-tight to give buoyancy to the dredge. A stationary rake having spring teeth is arranged at the lower end of the frame of the endless apron to assist in raising the oysters on to the curved teeth of the endless rake, which delivers the oysters into the vessel free from mud or dirt.

An improvement in overalls has been patented by Mr. Bernhard Guttman, of Plainfield, N. J. The object of this invention is to facilitate converting ordinary open front overalls into apron overalls, which cover and protect the breast of the wearer. The invention consista in an apron provided with suspenders and adapted to be attached to the waistband of the overalls in such a manner that it will cover and protect the breast of the wearer, the suspenders holding the apron in this position.

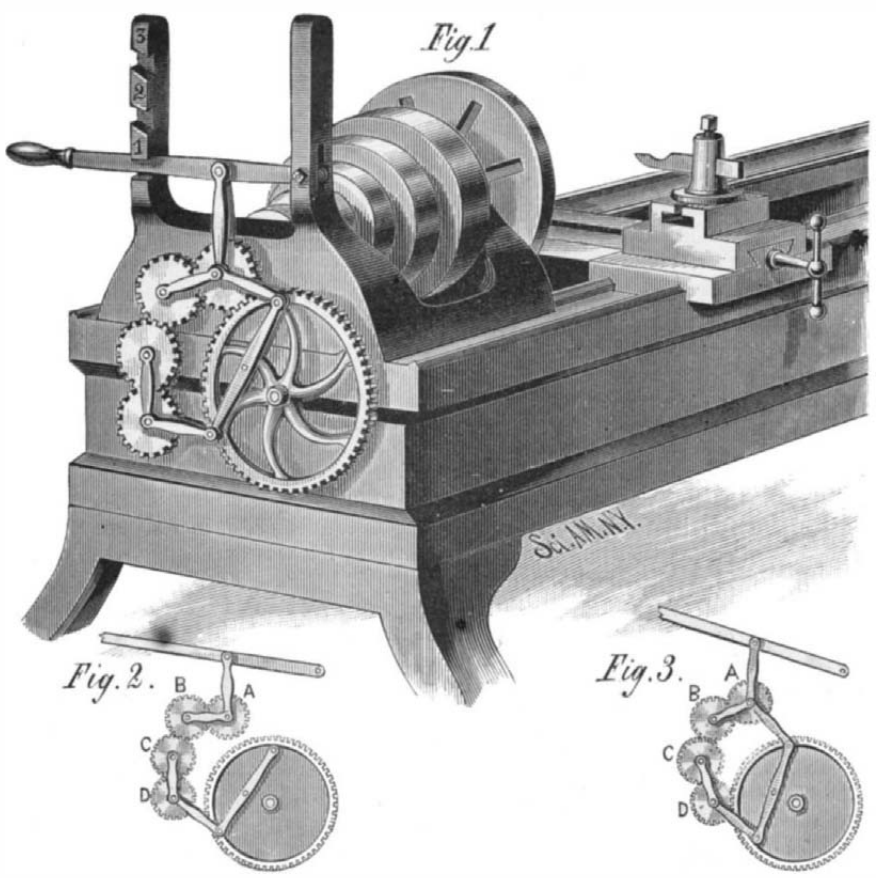
NEW DEVICE FOR OPERATING THE TOOL RESTS OF LATHES.

The engraving represents a new form of reversible feed gearing for engine lathes, recently patented by Mr. George Moll, of Mascoutah, St. Clair county, Ill. The object of the invention is to provide a device by means of which the feed mechanism of a lathe may be readily reversed or stopped.

Fig. 1 is a perspective view of the end of a lathe with the improvement attached. Figs. 2 and 3 represent the gearing in different positions.

The body of the frame of the lathe, the tail block, and the traveling tool rest may be of any suitable construction. The main gear wheel is secured to the end of the feed screw in the usual way, and receives its motion from the lathe spindle through the wheel, C, and the intermediate wheels, A, B, D. These wheels are all simultaneously controlled by means of the link mechanism shown, the rocking lever, and the main hand lever. The link mechanism consists of the link which connects the wheels, C D, the link which connects the wheel, A B, with the upper end of the pivoted lever, E, the link which connects the wheel, D, with the driving wheel, C, the link which connects the wheel, D, with the lower end of the pivoted lever, E, and the link which connects the whole with the main hand lever.

When the main hand lever is raised to its highest point the wheel, A, will be lifted out of contact with the wheel on the feed screw, and the wheel, D, will be brought into engagement with the main wheel, as shown in Fig. 3, and thus impart forward motion to the tool rest. When the lever is brought to its lowest point the wheel, D, will be carried out of contact with the main wheel, and the wheel, A, brought in contact with it, and thus impart a reverse movement to the tool rest. When the lever is brought to the intermedial point both wheels will be moved out of contact with the main wheel, as shown in Fig. 2, and the tool rest will remain still. The inventor informs us that this improvement is favorably received by machinists, and that it saves a great deal of time in mechanical operations requiring a reversal of the feed motion of a lathe.



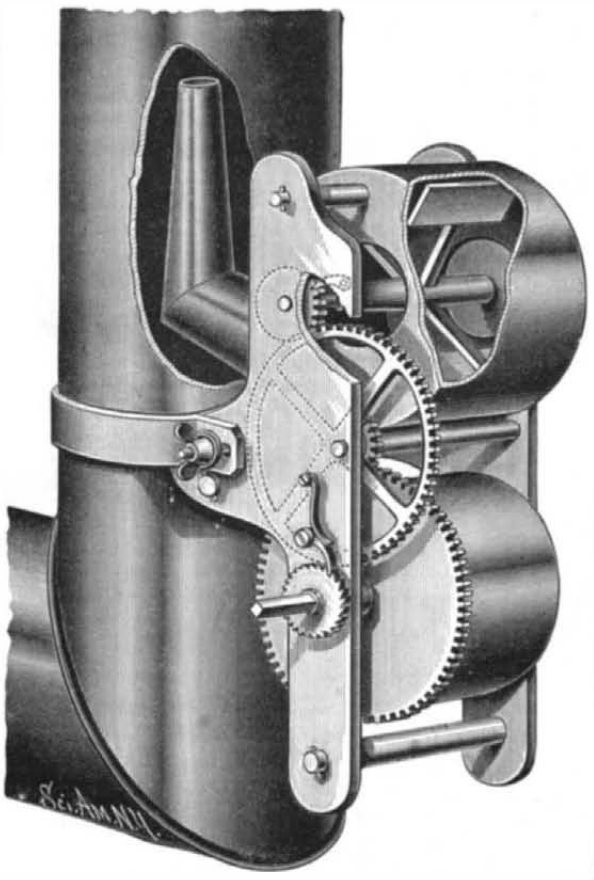
MOLL'S REVERSIBLE FEED GEAR FOR LATHES.

New Voting Apparatus.

Mr. Anthony C. Beraneck, P. O. Box 11, Englewood, N. J., has recently patented an improved apparatus for registering votes. The machinery of the apparatus is connected to the door of the apartment, and each opening sets the machinery so that a pressure on the knob or key will register one vote. The invention is ingenious and simple.

NEW DRAUGHT APPLIANCE FOR STOVES.

The annexed engraving represents a blower for creating a draught in stoves, chimneys, flues, ranges, furnaces, and engines, or anything or place where a blast draught is required. The machine winds up like a clock, and runs for any length of time, according to size of machine. It is easily attached to a stovepipe by a band surrounding the pipe. A hole can be made in a stovepipe and the blow pipe



BEAUMONT'S DRAUGHT APPARATUS FOR CHIMNEYS AND FLUES.

inserted so as to point upward, giving a powerful draught to the stovepipe or chimney and keeping them free from soot. By using this appliance any stove may be made to burn green and wet wood readily, creating a quick, hot fire with a much smaller quantity of fuel than a slow fire requires.

With this device any kind of coal and coke may be burnt. This apparatus is of special advantage when kindling a fire, and when it is desirable to produce a quick hot fire for any purpose. When the blast is no longer needed the machine may be stopped by dropping a pawl or dog into the teeth of the pinion on the fan shaft.

For further information address Fred. Beaumont, Jr., patentee, southwest corner of North and State streets, Little Rock, Ark.

Dangers of the Electric Light.

It is reported that the disastrous fire at the Landenberger Mill, Philadelphia, on Wednesday night, had its origin, as the local journals express it, in the "unaccountable flickering and sparks from the electric lights used in the establishment." If these statements be correct, it becomes a matter of no inconsiderable importance to ascertain from the scientists how far these eccentricities are likely to be permanent conditions of the use of these lights in other establishments. It is a serious business thus to have life and property at the mercy of their scintillations.—*Phila. Bulletin.*

There is more or less danger of the falling of sparks from all electric lights. Any imperfection in the carbon or irregularity in the driving engine will produce snapping and sparking. A simple safeguard is to place a glass cup around or under the carbon to catch the sparks.

Molecular Attraction.

BY F. D. BROWN, B.SC.

The author points out that if we regard chemical affinity as neutralized by the union of two elements, we are then unable to account for the reactions taking place between molecules, and involving an interaction of the atoms composing different molecules. If, however, the act of combination be regarded as producing no change in the chemical forces, and it be supposed that the same attraction is exerted between any given pair of atoms without regard to the state of combination of one or both of the atoms, then a reasonable account can be given of chemical reactions, and the existence of molecular combinations does not appear very remarkable. Further, we are provided with a more or less effective explanation of the relative volatility of substances. Reasoning from this point of view, and considering the carbon compounds specially, the author concludes that intermolecular attraction should be greater in an acid than in a corresponding alcohol; greater in an alcohol of high molecular weight than in a homologue of which the molecule is less complex; greater in a primary alcohol than in the secondary or tertiary isomeride; and finally, greater in a chlorinated compound than in the corresponding substance containing hydrogen. If the volatility of a substance be a measure of the forces of attraction between the molecules, then it must be admitted that the boiling points of organic compounds show with some reason that the above expression represents the value of intermolecular attraction. From this point of view the study of the latent heat of many carbon compounds would materially aid us in the solution of the problem of chemical affinity.

Visions in the Clouds.

Displays of aurora borealis are evidently infrequent in Delaware, Maryland, and Virginia. The local papers of the latter part of September and the first week in October contain numerous references to marvelous visions in the clouds, and exhibit a mediæval condition of popular intelligence in the rural districts scarcely less marvelous. The Warrentown (Va.) *Solid South* says: "A number of reliable and responsible people, whose names we can give, about a week ago, saw an apparition in the heavens, about 10 o'clock P.M., of white robed figures, which were supposed by those who saw them to be angels. It is all the talk of the people in and around the villages of New Baltimore and Buckland." The Richmond *Dispatch*, of the 7th, prints a note from Mr. M. C. Grasty, of Fredericksburg, Va., dated 5th inst., in which he says: "Many persons in this community claim to have witnessed a most alarming sight in the heavens some nights since, just before daybreak. The heavens are said to have been lighted, and vast numbers of soldiers appeared, uniformed, armed, and drilling. Who else saw it, and what is the explanation? Could it have been a mirage?"

Similar observations were made further north. A Wilmington, Del., dispatch says: "The people in this vicinity are greatly excited over what they believe to be supernatural manifestations. A little girl, some three weeks ago, living in the village, saw after nightfall, before the moon was fairly up above the horizon, platoons of angels slowly marching and countermarching to and fro in the clouds, their white robes and helmets glistening in the light. At intervals the heavenly visitors would dance mournfully. Her father also saw the spectacle. Monday night, two weeks ago, William West, a farmer living near Georgetown, the county seat, saw bands of soldiers of great size, equipped in dazzling uniforms, their muskets shimmering in the pale, weird light that seemed to be everywhere, marching with military precision up and down, and presenting arms. The vision lasted long enough to be seen by a number of West's neighbors. Many people living near Laurel, many miles away, situated in the lower end of the Peninsula, saw the same extraordinary phenomena. A few go as far as to say that they distinctly saw in the midst of the soldiers, and conspicuously by reason of his size and commanding presence, the hero President himself, with every feature distinctly and vividly portrayed. In Talbot county the illusion was seen by numbers."

MR. CHARLES VAN BENTHUYSEN, of Albany, who died in this city, October 19, is said to have been the first printer in this country to introduce steam power in printing. The engine with which this important experiment was made is still in the possession of the family.

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MISCELLANEOUS INVENTIONS.

Mr. Henry Reny, of Lewiston, Me., has patented an improved valve for musical instruments, such as trumpets, cornets, etc., which has a smaller stroke than the similar valves in use heretofore, and is therefore much more convenient for the musician or performer.

Mr. Aaron S. R. Overholt, of West Overton, Pa., has patented a nut locking device for fish joints of railroad rails. It consists of a gib keeper formed to fit snugly into the recesses formed by the top of the rail flange and the lower side of the nut and to clasp firmly the two sides of the nut; and also in a metallic tinned washer, by which the gib keeper is secured and maintained firmly in place within the recess in such a manner as to effectually prevent the jarring out of the gib or the unscrewing and loosening of the nuts by the jar incident to the traffic upon the road, and to provide for the removal of the gib as occasion may require.

An improved washing machine, patented by Mr. Robert D. Bennett, is so made as to allow the introduction and removal of the articles operated upon without removing the rubber from the tub. This invention consists in hinging one end of the rubber to radial arms extending from the shaft, and providing the other end with hinged bolts engaging in slots in other radial arms, whereby the said rubber may be lifted from one end for the introduction and removal of articles and then secured in place. This machine is intended to imitate handwork. Any information in regard to it may be obtained by addressing Mr. Marcius Bibbero, New York city.

Mr. Charles Oliver Chaplin, of Ridgeway Corners, Orleans Co., N. Y., has patented a fruit drying apparatus, which comprises a drying chamber heated by a furnace arranged at one end of the latter, and an endless chain of pendent grooved carriers for the support of trays on which the fruit to be dried is placed, said endless chain engaging and disengaging with notched wheels within the drying chamber, and being supported by wheels which run upon suitable upper and lower tracks. The invention consists in various peculiarities of construction and combinations of parts, whereby increased facility is afforded for tempering the heat of the drying chamber, for giving an easy traveling action to the trays through said chamber, and the top of the furnace compartment not only supports the furnace but serves as a stand for the operator in introducing and removing the fruit trays; also provision is afforded for charging the furnace through its top.

An adjustable trace loop has been patented by Mr. William G. Riley, of Corydon, Iowa. The object of this invention is to provide a simple and inexpensive loop for attaching a back band of a harness to a trace in an adjustable manner, so that the back band can be easily moved forward or backward, as well as lengthened or shortened, to accommodate horses of different sizes. To these ends the trace loop, which is adjustable both vertically and laterally, has deep rectangular recesses cut crosswise at its center to provide for a snug hold of the trace, and is furnished with a narrow central pin plate, which affords every facility for adjustment of the back band.

An improved feathering propeller has been patented by Mr. Alexander Davidson, of Springfield, Ill. The invention consists in a paddlewheel provided with pivoted oscillating rectangular bucket frames having longitudinal supporting bars and cross bars to resist pressure, in connection with oscillating buckets. It also consists in a combination with the main frame of a paddlewheel of bucket frames controlled by eccentrics and supporting oscillating buckets which are hinged to the forward part of the frame and have their rear edges free to vibrate, whereby the buckets when propelling are held at right angles to the line of progression and assume the position of least resistance when feathering. This propeller is readily adaptable to both deep and shallow water, may be arranged to work either vertically or horizontally, and be only partially immersed or wholly submerged.

TRADE MARK DECISIONS BY THE COMMISSIONER OF PATENTS.

EX PARTE FRIEBERG & WORKUM.

Appeal from the Examiner of Trade Marks.

TRADE MARK.

Marble, Commissioner:

Appeal is taken from the decision of the Examiner of Trade Marks in refusing to register as a trade mark subject-matter described as follows:

The words "J. A. Bowen" and the arbitrary symbols of a shield on which is emblazoned the arms of the United States. These have generally been arranged as shown in the accompanying facsimile, the words "J. A. Bowen," in a curved line, forming the upper part of a circle, and theword "Bourbon," in an inverted curved line, forming the lower part of a circle. Between these words is the representation of a fancy shield, upon which appears the Stars and Stripes, that form the conventional armorial bearings of the United States of America; but the word "Bourbon" may be omitted without materially altering the character of our trade mark, the essential features of which are the words "J. A. Bowen" in connection with the shield having emblazoned thereon the Stars and Stripes, that form the conventional armorial bearings of the United States of America, the whole surrounded by a plain circular border.

It is stated in the application that this alleged trade mark has been continuously used in the business of the applicants as a trade mark on whisky since the year 1857. The application was rejected by the Examiner because applicants refused to erase therefrom the words "J. A. Bowen," the attorneys of applicants having admitted that he was the person whom the applicants succeeded in business. The Examiner's objection to the registration of said trade mark is stated as follows:

Their use of this name is evidently intended to inform the public of the fact that they are the successors in business of J. A. Bowen, and are now engaged in the distillation of liquors formerly sold under his name. It would seem to the Examiner that this is simply a transfer of "good will," and nothing more.

A trade mark is an arbitrary character or characters without special meaning, adopted by persons, firms, or corporations for the purpose of identifying the goods manufactured by them or of which they have the sale. Persons have the right to adopt any device or form of words possessing these characteristics as their trade marks so long as public propriety is not violated. It may be true in this case, as it is in many cases, that the name of a person associated with a particular trade or business carries with it the good will of the establishment with which he was connected. If it is the good will simply that is sought, then it should not be registered as a trade mark; but if the name of a person possessing the characteristics of a trademark in itself, not an applicant, is adopted by any person, firm, or corporation to identify their particular goods, I see no good reason why it may not be used as a trade mark and be registered as such. On the contrary, there are many reasons why it may be so used. The long use of the name of a particular person with a particular class of goods manufactured by that person or in his name, serves to identify those goods as particularly as any other character, device, or collection of words. This is all that is required to make it a legal trade mark. Whether persons other than the person whose name is used have the right to use such name is another question. In this case it is claimed that the applicants have used this name with the device mentioned as their trade mark upon their goods since the year 1857. This is sufficient *prima facie* evidence of their legal right to use it.

The decision of the Examiner is overruled, and the certificate of registration will issue in due course.

Frederic Sauvage.

The London *Times* gives a sketch of the life of Frederic Sauvage, to whom the people of Bologne have just erected a statue, as the inventor of the screw propeller. His claim to this honor rests on the fact that in 1832, hearing that the French Government proposed to build a number of paddle steamers, he was led to devise a better means of propulsion, and eventually he constructed a screw.

Early in that year Sauvage exhibited to the Boulogne authorities his new invention, which was highly approved. As he was anxious to bring it under the notice of government, he gave up his Boulogne residence and left for Paris, where he took out a patent for fifteen years. The screw was acknowledged to have its advantages with small boats, but the commissioners, who sat by order of the Minister of Marine to report on it, concluded that it would be of no use for large vessels.

The English Government, in 1835, it is stated by the *Times*, offered him a sum for the invention, on the condition that it was to become the exclusive property of England, but the inventor, who was at that time stricken down by poverty, would not consent. It is further said that Sir Francis Pettit Smith derived his first idea of a screw from a visit to Sauvage's workshop.

In 1841 Sauvage made an agreement with a shipbuilder and an engineer for the construction of a steamboat, to which the screw was to be fitted, he giving the plans, while they carried them out, and at their own expense, but the agreement, owing to a technical misunderstanding, was badly worded. The boat was built and fitted, but not as Sauvage wished, and the two others took all the credit. The unlucky inventor, forsaken by all, after many years of toil, was, in the year 1843, shut up in the debtors' prison at Havre, where he remained some time, but was eventually released through the instrumentality of Alphonse Karr, who had taken a deep interest in him. From the time he had set on foot his experiments with the screw, he had spent in be course of ten years about 80,000 francs (£3,200), in exchange for which he afterward received from the State a yearly grant of 2,500 francs (£100). Driven to despair, and in deep misery, Sauvage, who was advanced in years, was conveyed in April, 1854, to the Picpus Asylum, where he passed the remainder of his life, dying at the age of 71.

The townpeople of Boulogne, in 1872, through the mayor, M. Auguste Huguet, had his remains removed from Paris and interred in the cemetery, where a monument surmounted by a bust was erected to his honor.

It is probable that Sauvage's claims will receive but little attention outside his own country. In England, it will be remembered, in 1770, James Watt, writing to Dr. Small, proposed to use one of his steam engines to drive a screw for the propulsion of a ship. In 1776 the American, Bushnell, described a submarine boat propelled by a screw. Trevithick patented a screw propeller in 1816; and before him, in 1800, Edward Shorter patented a propeller, which was afterward, in 1802, tried on H. M.'s ships Dragon and Superb. In America, Stevens, in 1804, tried to propel a boat by a screw. In 1816, Millington described a screw with a very ingenious steering arrangement connected to it, and this was apparently the first of a great number of attempts which have been made in that direction—all, as yet, unsuccessful. From this date till the date of F. Pettit Smith's invention (1836), the records of the Patent Office show that many minds were working in the same direction. The point of Smith's invention was the placing of the screw propeller in the dead wood of the vessel, nor has it ever been claimed for Smith that he was the inventor of the screw propeller, though he was, there seems little doubt, the one to bring it into actual use. There seems little question that Sauvage did nothing more than was done by very many others—by Watt, Trevithick, and the rest—conceived a most valuable idea, but never carried it beyond the stage of a model.

Sylvester Doolittle.

One of the pioneers of American internal commerce, Sylvester Doolittle, died recently in Oswego, N. Y., in his 82d year. Mr. Doolittle built and owned the first canal boat that made the trip from Rochester to Albany. It was called the Genessee of Wheatland, and carried a cargo of flour. This in 1822. For several years Mr. Doolittle built packets and freight boats, and in 1826 removed to Utica, where he built, owned, and commanded the first canal boat that passed down the Hudson River to New York. She was called the City of Utica, and carried oats and lumber. In those days all the Hudson River lines carried freight, and none of them would tow his boat to New York. At length he induced a Mr. Hitchcock, who owned a small steamer running independently of any line, to tow him. He moored at Coenties Slip, and his queer craft was visited by many curious New York merchants. He reloaded with merchandise, which he delivered at Utica, and soon towage of canal boats to New York became a large business, which it still continues to be. When the railroads destroyed the packet business Mr. Doolittle removed to Oswego and built vessels for the lakes.

In 1841 Ericsson's screw propeller engaged his attention. Ericsson met with little success in introducing it, and in consideration of Mr. Doolittle's putting it in one of his boats, agreed to give him the right to use it in all the vessels he might build in three years. Mr. Doolittle immediately built the propeller Vandalia, the first screw wheel steamer that sailed the lakes. She made her first trip through the Welland Canal to St. Catharines at a speed of six miles an hour. Crowds of people turned out to see her, and a public dinner was given Mr. Doolittle at St. Catharines. The next year he had a line of five propellers on Lake Ontario, and soon they were on all the lakes.

The Land Slip at Elm, Switzerland.

In the recent disaster at Elm—otherwise known as Unterthal—a great mass of earth and rock from the Plattenberg or Tschingler Alp, 1,500 feet wide, at least 2,000 feet high above the valley, and, according to the engineers, from 60 to 100 feet deep, fell over upon the village, its farms, gardens, and meadows, covering several thousand acres. Tons of rock were dashed entirely across the valley, and now rest quietly 300 and 400 feet high upon the hillside. The air pressure was so great that houses were lifted up from their foundations and carried a distance of 1,000 feet. A barn built of heavy logs, and filled with hay, was carried entirely across the valley and overturned 200 feet high on the mountain opposite the Plattenberg. An iron bridge which crossed the Sernf was torn up, carried scores of feet away from its abutments, and now rests on end more than half buried in mud and loose stone. The whole valley, as far as it can be seen from the village inn, which is still standing, very closely resembles the bed of a glacier which has receded.

The river Sernf has made for itself a new channel through the *débris*, and has flooded and ruined much of the land below, land which was not directly harmed by the avalanche of stone. So in one way or another the whole valley has been injured beyond all hope of repair. The loss in property will reach not less than 2,000,000f.; at the lowest estimate 123 people have lost their lives; other estimates make the number 150 or more. The state engineers, fearing further land slides, have forbidden those who have escaped to return to the houses which remain standing, and in consequence more than 800 men, women, and children, who but a few days before were prosperous and well-to-do, are now almost without a roof to cover them.

The chief cause of the disaster, after the heavy rains of the past summer, is said to have been injudicious quarrying for slate, whereby the mountain was in part undermined and so rendered unsafe. Some three years ago ominous signs of danger were observed, and the cantonal forest master, Herr Seeli, warned the proprietors of the quarries that they were carrying on their excavations beyond the bounds of safety. The work went on without interruption until Thursday, Sept. 8, when the premonitions of disaster became so alarming that all the men were withdrawn from the quarries; yet no one seems to have thought the village was in danger until Sunday afternoon, when, as the people were coming from church, a quantity of stones, rolling from the Tschingler, crushed several houses in Unterthal nearest the foot of the Alp. Ten minutes later came the great catastrophe; a thunderous noise rent the air, a black dust-cloud overspread the valley, and all was still. In those two or three seconds Unterthal had disappeared, and with it were buried nearly every one of the unfortunates, who a few minutes previously were worshiping in the village church. Scarcely any, in fact, who on the first alarm crossed the Sernf, either out of curiosity or fear, to lend a helping hand to those whose houses had been struck, escaped, and they include nearly all the manhood of the village. Forty dwellings, the best in the village, were buried.

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This is not the first disaster of the sort in Switzerland, nor anything like the worst. On the 4th of September, 1618, the rich though small town of Plurs, in the Grisons (near the Engadine valley), was entirely buried by a land slip. Over 2,400 persons lost their lives. The site is now occupied by a fine forest of chestnut trees. No remains of the town have ever come to light, with the exception of a bell which belonged to the church, and which turned up twenty years ago.

On the 2d of September, 1806, the Rossberg, a mountain some miles to the north of the Righi, gave way on its eastern side, and slid down into the lake of Lowerz, which is half filled up, converting the once picturesque slope, studded with chalets, pasturages, and herds of cattle, into a chaotic mass of mud and rock. 111 houses and 457 persons were overwhelmed and seen no more.

The occurrence of all these catastrophes in September points to a common cause, the overcharging of the steep mountain slopes with water after periods of unusual rain.

The Brooks Denning Comet.

The new comet in Leo, discovered independently by myself, on the morning of October 4, at 2 hours 45 minutes —civil reckoning—and by Mr. Denning, of England, the following morning, has been observed at the Harvard College Observatory and at Dun Echt, Scotland.

From these observations Prof. S. C. Chandler, of the Harvard Observatory, has computed and just sent me the following elements and a finding ephemeris:

ELEMENTS.

Perihelion Passage, 1881, September 3.47. G. M. T.

Long. Perihelion, 20° 15′
Long. Node, 82 29 } Eq. 1881.0.
Inclination, 10 25

Log. Perihelion Distance, 9·8605.

Motion direct.

EPHEMERIS.

Wash. midnight. 1881.	R.A. h.	R.A. m.	R.A. s.	Decl. °	Decl. ′	Log. r.	Log. △.	Light.
Oct. 12.	9	4 1	12	+14	50	0·0222	0·0636	0·71
16.	9	49	24	14	53	0·0438	0·0751	0·61
20.	9	57	4	14	56	0·0648	0·0857	0 53
24.	10	4	0	+15	0	0 0858	0·0946	0·46

Light on October 4 is taken as unity.

On the 20th and 24th inst. the comet will be just above and within three degrees of Regulus, and will move very slowly eastward from that point. It is growing fainter, being at the last named dates about one-half as bright as when first seen at my observatory. It is suggested by Mr. Chandler that it may prove to be a periodic comet of about six years eleven months, and observations with large telescopes will be of great value in determining this interesting point.

It was well seen by me at discovery, in the absence of moonlight, with a telescope of five inches aperture.

WILLIAM R. BROOKS.

Red House Observatory, Phelps, N. Y.,
October 15, 1881.

A Singular Accident.

The engine house of the Nightingale Brothers' silk mill in Paterson, N. J., was demolished by the bursting of a flywheel, October 19. Pieces of casting weighing five or six hundred pounds were thrown half a block away, but fortunately no lives were lost. The engine, of about 100 horse power, had lain idle for years, a smaller one having been used since the mill was turned from a cotton to a silk factory. The addition of new machinery, however, required the use of the big engine for additional power, and machinists had been at work on it several days. On Tuesday afternoon it was run experimentally, and seemed to go all right. The governor was arranged for it to make 60 revolutions a minute. Wednesday morning, when the fireman started up the boilers, the engine started off on its own account and could not be stopped, as the steam supply valve was already closed, and there was no apparent reason for its going. It continued to increase its speed until it was estimated that it was running at the rate of 150 revolutions a minute. The limit of safety was considered to be 75 revolutions. In alarm the few men about the building fled for their lives, except fireman Carlough and a workman named James Killen, who were still trying to turn off the steam valve, when the flywheel broke and the pieces flew in every direction. The flywheel was 15 feet in diameter, and weighed eight tons. The engine house, which was about 30 by 15 feet and two stories in height, was almost demolished. The cause of the engine's sudden starting was discovered to be a fracture in the seat of a new supply valve in the main steam pipe leading to the engine. In shutting off steam on Tuesday night it is supposed the pressure broke off the fractured seat, which left the pipe open for the passage of steam from the boiler.

Another Keely Motor Exhibition.

Keely has just given another exhibition of his celebrated motor, or, rather, of a combination of cylinders, plungers, pumps, globes, and connecting rods, somewhere within which his motor was alleged to be at work. The trial was a very peculiar one. This motor has been threatening, for the last six years, to run a train of cars to New York and a vessel to Liverpool on about a cupful or bucketful of water. What Keely actually did was to turn a wheel, as one experiment; to fire a bullet through three inches of plank as another; and to perform two or three other trivial feats, any of which could be produced by a very ordinary use of very familiar forces. When it is added that the exhibition was given in Keely's own workshop, and that the room directly underneath, also occupied by him, was kept locked and bolted, and that he refused, in some confusion, to allow his visitors even to look into it, the value of the trial is obvious. To make the thing complete, the inventor, before each experiment, scraped a large tuning fork with a fiddle bow, in order to get the right pitch for the motor, which was hinted to be derived from the force of cohesion. Instead of the presto! agrimento! change! of mere conjurers, Keely gave an explanation that, by means of the introductory impulse and the fifth compound, he so impinged on the molecular lead as to disturb the equilibrium, and then to multiply the atomic ether or liberated interatomic impulse. The only thing in the workshop, visible or invisible, which the assembled party seemed to understand, was the collation. But there is no denying the fact that by dint of some qualities Keely has kept this sort of thing going for six years, and that he still finds stockholders who have abundant faith in him.—*N. Y. Sun.*

New York Board of Health Rules for Plumbers.

Under the new law for the registration of plumbers and the inspection of plumbing by the Board of Health, the board has adopted the following regulations:

Whenever any plumbing work is completed, and before it is covered from view, the board must be notified in order that it may send an inspector. The arrangement of soil and waste pipes must be as direct as possible. The drain, soil, and waste pipes and the traps should, whenever practicable, be exposed to view for ready inspection at all times. When placed within walls or partitions they should be covered with woodwork fastened with screws, so as to be readily removed. In no case should they be absolutely inaccessible. Every house or building must be separately and independently connected with the street sewer by an iron pipe calked with lead. The house drain must be of iron, with a fall of at least half an inch to the foot if possible. It must be provided with a running trap placed at an accessible point near the front of the house, and there should be an inlet for fresh air entering the drain just inside the trap of at least four inches in diameter, leading to the outer air, and opening at any convenient place not too near a window. No brick, sheet metal, or earthenware flue shall be used as a sewer ventilator, nor shall any chimney-flue be used for this purpose. Every soil pipe and waste pipe must be of iron, and must extend at least two feet above the highest part of the roof or coping, of undiminished size, with a return bend or cowl. Horizontal soil and waste pipes are prohibited. All iron pipes must be sound, free from holes, and of a uniform thickness of not less than one-eighth of an inch for a diameter of two, three, or four inches, or five thirty-seconds of an inch for a diameter of five or six inches. Before they are connected they must be thoroughly coated inside and outside with coal tar pitch, applied hot, or some other equivalent substance. Iron pipes, before being connected with fixtures, should have openings stopped and be filled with water and allowed to stand twenty-four hours for inspection.

All joints in the drain pipes, soil pipes, and waste pipes must be so calked with oakum and lead, or with cement made of iron filings and sal-ammoniac, as to make them impermeable to gases. All connections of lead with iron pipes should be made with a brass sleeve or ferrule, of the same size as the lead pipe, put in the hub of the branch of the iron pipe, and calked in with lead. The lead pipe should be attached to the ferrule by a wiped joint. Every sink, basin, wash tray, bath, safe, and every tub or set of tubs must be separately and effectively trapped, and the traps must be placed as near the fixtures as practicable. Traps should be protected from siphonage by a special metallic air pipe not less than one and a half inch in diameter. Every safe under a washstand, bath, watercloset, or other fixture must be drained by a special pipe not directly connected with any soil pipe, waste pipe, drain, or sewer, but discharging into an open sink upon the cellar floor or outside the house. All watercloset inside the house must be supplied with water from a special tank or cistern, the water of which is not used for any other purpose. The closets must never be supplied direct from the Croton supply pipes. A group of closets may be supplied from one tank, if on the same floor and contiguous. The overflow pipes from tanks should discharge into an open sink or into the bowl of the closet itself, not into the soil or waste pipe, nor into the drain or sewer. When the pressure of the Croton is not sufficient to supply these tanks a pump must be provided. Rain water leaders must never be used as soil, waste, or vent pipes, nor shall any soil, waste, or vent pipe be used as a leader. No steam exhaust will be allowed to connect with any soil or waste pipe. Cellar and foundation walls should be rendered impervious to dampness by the use of asphaltum or coal-tar pitch in addition to hydraulic cement. Yards and areas should always be properly graded, cemented, flagged, or well paved, and drained by pipes discharging into the house drain. These pipes should be effectively trapped.

A Steel Tube for the English Channel.

A grand scheme is said to be in contemplation for crossing the English Channel. A line of steel tubes, sixteen feet in diameter, is proposed, to be sunk and firmly anchored at a sufficient depth below the surface to be out of the way of navigation. It is to be ballasted to overcome the buoyant effect, and secured to sunken caissons by chains.

Superheated Steam.

BY PROF. S. N. CARVALHO.

The vast and continuous increase in the use of steam for motive purposes, particularly during the last twenty years, and the consequent enormous consumption of coal (85,000.000 of pounds per annum) have furnished an incentive to inventors in this direction second to no other of modern times. The well understood fact that the most economical form of steam engine yet devised—considering the boiler and engine as a whole—renders us in useful energy but about 15 per cent of the true energetic value of the fuel consumed therein, presents the considerations of any improvement that may transmute into useful power some greater proportion of the heat evolved by the combustion of fuel, as the most important problem of the present day.

Superheated steam has been demonstrated by the most distinguished engineers, from Watt down to the present day, as the best means of preventing "cylinder condensation," to which has been attributed the true cause for the enormous loss sustained in the use of the steam engine by the present method of using saturated steam. The way this loss occurs is exemplified as follows: With a cylinder in which steam at half-stroke, or 50 per cent cut off, is used—say at any pressure—imagine the steam admitted until the piston reaches half-stroke, the boiler communication closed, and the steam allowed to expand through the rest of the stroke, the exhaust opened, and the piston returned—then upon the steam coming in on the next stroke, we should expect to find the internal surfaces in the same condition as they were at first. But experiments and all experience have shown us, that in the operations which have gone on during the first stroke, the internal surfaces have become chilled to a certain extent, and that a considerable portion of the steam entering is condensed by them, and converted into water.

This fact has been shown by Isherwood in his experiments, made with great care and expense, and the result has been found to be nearly 39 per cent loss, at half cut off—and the best engineers now estimate that about one-third of the fuel is wasted in this way. The only known remedy for the prevention of cylinder condensation is the proper use of superheated steam, by which one-third of eighty-five millions would be about twenty-seven millions of tons of coal per annum, amounting to nearly $100,000,000 per annum.

Let us give an example of the manner in which superheated steam acts in the cylinder. First, it follows a different law from saturated steam; it is governed by Marrotte's law of gases and air. You can, by the addition of 480° of heat to the steam in a separate vessel, or superheated, double its volume and also its pressure; if it were attempted to raise steam in a boiler to 692°, it would have to be strong enough to stand a pressure of 2,500 lb. to the square inch. Superheated steam is the safest and most economical method of using steam.

One pound of water heated in a boiler to 212° is, by the addition of 966 units of heat, converted into 1,720 volumes of steam at atmosphere pressure. The 1,720 volumes may be taken as the measure of the available mechanical force—the 966 units of heat are worth 1,720 volumes of steam. Now, if these 1,720 volumes of steam at 212° be raised 480° higher, or to 692°, you will have 3,449 volumes of steam at *double the pressure*, or 15 lb. to the square inch. The 480° used upon the steam has given you the same quantity as 966 units used upon the water.

How much heat is required to raise 1 lb. of steam 480°? The specific heat of water is 1,000—the specific heat of steam is 0·475, or a unit of heat will raise 1 lb. of water 1°—and 1 lb. of steam 2°. But in our case, suppose the steam was raised 480°, and now it is evident at a cost of 240 units of heat, the 240 units of heat used in superheating have done the work of 966 units used upon water; heat goes *four times further* on steam than it does on water—if the heat costs the same as when used upon water, the clear gain is 25 per cent.

The primary causes of cylinder condensation are external and internal radiation of the metallic surface—conversion of heat units into work—and conversion of heat into work done during the first rush of the steam from the cylinder after the opening of the exhaust. A further economic effect is produced by the great increase of volume of steam caused by the addition of superheat. If 400° is required in the cylinder (which it is perfectly safe to use) at one-half cut off, it would be necessary to have your steam in the superheater at about 596°, so that having it expanded down to 400° at the half cut off, you not only suppress entirely cylinder condensation, with its enormous save, but you increase your power about one-sixth.

The *modus operandi* of superheated steam in the cylinder is this: All superheat is given off *before condensation commences*; the moment the superheated steam enters the cylinder the superheat is absorbed by the metallic surfaces. The piston is now propelled, with steam less the superheat, to the point of cut off. When a portion of the steam is converted into work, and the balance expanded into the remaining half of the cylinder, now the superheat absorbed by the metallic surfaces (upon the principle that all things in nature seek their equilibrium) gives out its superheat to the devitalized steam, revivifies it to a condition to enable it to perform the other half stroke, and the exhaust is then discharged at saturation. Steam used in this way makes the modern steam engine the most perfect in the world. It enables the maker to exhibit it as a real steam engine, and not one working half water.—*American Railroad Journal.*

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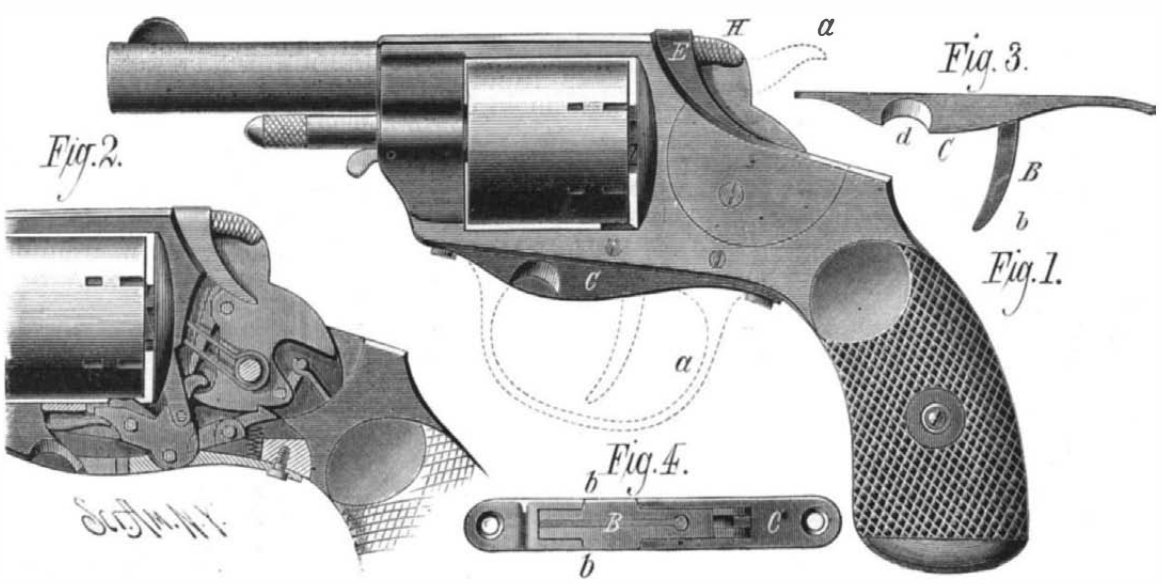
SAFETY SELF-COCKING ARMS.

Portable firearms, to perfectly meet all requirements, should combine three essential elements—compactness, rapidity of action, and safety in handling. The only advantage of revolvers, as compared with repeating rifles, is their smaller bulk and weight, as they are inferior in rapidity of firing, and still more so in accuracy and penetrating power. Among revolvers, again, the ordinary hand-cocking revolver is superior in safety and compactness to the self-cocker, but greatly inferior to it in rapidity of firing. Self-cockers, as usually made, are clumsy and particularly dangerous to handle, and this has overweighed the advantages they present for rapid firing. A compact and safe self-cocker which avoids these difficulties is shown in the engraving.

The usual bulky open guard and the fixed projecting trigger are replaced by a low-closed guard and a folding trigger, shown in Figs. 1 and 2. The dotted lines, *a a*, show the position of the parts dispensed with, and show how much is gained in compactness by this improvement. The folding trigger, B, Figs. 2 and 4, is readily projected from the guard, C, by pressure on the lugs, *b b*, placed on either or both sides of the trigger, and assumes the usual position of the trigger shown by dotted lines in Fig. 1. The lugs, *b b*, on the trigger, and the slots, *d d*, in the guard to receive them, are placed so that the trigger cannot be folded back into the guard when the hammer is either at full cock or entirely down, but only when it is at the safety notch, or at half-cock. This impossibility of securing the trigger in the guard unless the hammer is at half-cock, is a very ingenious and effective means of preventing the many accidents which result from arms carelessly carried with the hammer in a dangerous position. The very simple device of slitting the trigger longitudinally in the manner shown in Fig. 3, transforms the trigger itself into a spring, and retains it in the guard by friction when folded up.

The face of the hammer, when at half-cock, is protected by a shield or hood, E, Fig. 1, and the usual thumb-piece being dispensed with, there are no projecting parts susceptible of catching and causing an accidental discharge of the arm. The roughened top, F, of the rounded hammer, is found to practically answer the same purpose as the thumb-piece, in bringing the hammer to full-cock by hand, as soon as the hammer is brought beyond half-cock by the trigger. Altogether, a self-cocking revolver of this model is lighter, more compact, and safer than the usual revolver, and infinitely more so than the usual self-cockers. The current form of self-cocking revolvers can readily be modified to this system, which can also be adapted to other kinds of firearms, and es pecially to the now popular styles of so-called "hammerless" guns.

For further information address the patentee, Mr. J. N. Proeschel, at Milwaukee, Wis.



SAFETY SELF-COCKING REVOLVER.

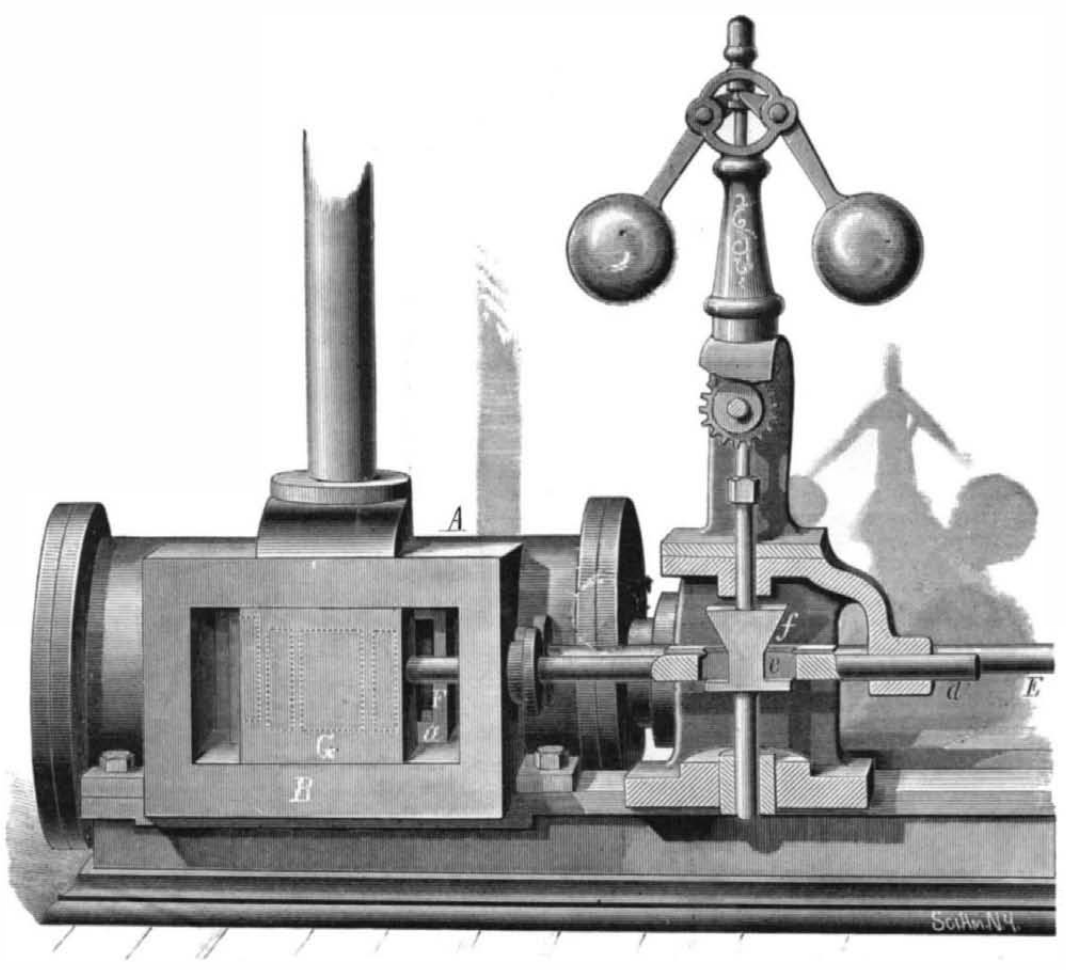
NEW ENGINE CUT-OFF.

This invention relates to a variable cut-off for the ordinary slide valve steam engines, which is rendered automatic by connection with the governor, the combination being very simple and effective.

In the engraving, A represents the cylinder, and B valve chest of an ordinary steam engine. The eccentric rod, E, is connected to a gridiron valve, F, having steam ports, *a b*, and an exhaust port, C, working in conjunction with the steam ports and exhaust ports of the cylinder, as usual. On the back of the valve, F, is a plate, G, forming the cut-off valve, this plate or valve being held firmly against the back of the valve, F, by the pressure of steam, and being dependent for its movement upon this frictional contact with the valve, F.

A stem, *d*, projects from the plate or valve, G, through a stuffing box in the valve chest, and this stem is provided with a yoke, *e*, which embraces a wedge-shaped block controlled by the governor. The wedge, *f*, thus acts as a stop to limit the extent of movement of the cut-off plate or valve, G, the movement being contracted as the wedge is depressed, and an increased movement being permitted as the wedge is raised, the variations in the movement of the plate, G, are caused to regulate the cutting off of the steam to the cylinder. The wedge exerts no control, practically, over the movement of the valve, G, the latter moving with the valve, F, throughout the entire throw of the latter, so there is no resistance of the entrance of steam into the cylinder from the beginning almost to the end of the stroke, hence there is no labor on the governor except to raise and depress the wedge; the wedge shortens the throw of the valve, G, and thereby cutting off the steam proportionably with its position.

Further description being unnecessary, except that if the governor should stop from any cause, such as the breaking of the belt, the wedge-shape block has an enlarged portion, so that its position in that case will be inside of the yoke on the valve steam, *d*, and shorten the stroke to limit the speed of engine. Further information can be had by addressing Orr. Hess & Morgan, 1219 Callowhill street, Philadelphia.



IMPROVED ENGINE CUT-OFF.

A Mediæval Guillotine.

The Chapel Bridge, at Lucerne, contains a mediæval painting representing the persecutions of the Helvetian Christians under the pagan Emperors of Rome. On the right side of the picture a number of Christians are being hurled into a river, perhaps the Reuss. On the left side a very evident guillotine is erected, one Christian lies with his head on the block, and the huge iron is just about to be let drop upon him, while a number of headless bodies lie around with the heads close beside them. It is commonly believed that this decapitating machine was the invention of Dr. Guillotin, a French physician, and member of the National Assembly of 1789. The Lucerne painting was made at a much earlier date.

Engineering at the Washington Monument.

The Washington monument is too near to be ever regarded by Washington people as anything out of the ordinary run of things. Few people here ever stop to think what a feat of engineering has been undertaken in the construction of this monument. "There is nowhere in the world such mechanical appliances as we have in the monument," said Colonel Casey to a *Star* man. "The last course of stone laid weighed 170 tons Now this 170 tons was raised vertically a distance of 245 feet, and the course was laid in fifteen hours. In other words, two feet of the monument was built in that time. You haven't any idea of the amount of stone and the amount of work required to build the monument. The stone we have laid since the work was resumed, if taken down and spread out, would cover the entire monument lot. At a distance the monument looks small; the yardarms on the derricks on top look like broom splints; but when one gets nearer them and sees how large they are, how wide the structure is, he gets some notion of the work."

If the monument was being constructed in France, or some other European country, the name of the engineer would already be famous, and when his work was finished, if it was approved, he would receive a fortune as his reward. It is doubtful whether the engineer connected with the Washington Monument will ever have any special recognition by the government. He will never receive any pecuniary recognition. An old engineer officer, speaking of this matter, said: "If Colonel Casey was not in the army, and had charge of one of the several works for which he is now responsible, his salary would be $10,000 or $15,000 a year ; as it is now, he draws $3,000 a year. The government pays too high figures for services rendered in inferior places, and much too little for professional services. —*Washington Star.*

The Severn Tunnel.

After some rather formidable difficulties, the two main headings of the Severn tunnel, in course of construction for the Great Western Railway Company, were united on the night of September 26 last, and a clear passage thus made under the bed of the river. The difficulties have been brought about chiefly by the flooding of the headings, which occurred now nearly two years ago. Water from springs in the surrounding hills on the Monmouthshire side drove in a large mass of the somewhat fractured pennant sandstone through which the tunnel passes, and so filled the workings on that side. The heading on the Gloucester side also filled, and the work was stopped, as described in our impression for the 24th October, 1879. There was at that time only 120 yards of the heading remaining to be driven. Very powerful pumping machinery was then put to work under the contractor, Mr. A. T. Walker, to whom the completion of the tunnel was let, and the work of driving the heading was resumed after several months' delay. The meeting of the two headings shows but three inches of divergence, and considering that the distance driven has been upward of two miles, that the headings are 7 feet high, with a width of 7 feet, started from a base of only 15 feet, the work, it will be seen, reflects great credit on the skill and attention of the engineering staff. It should be mentioned that the heading from the Monmouthshire side was driven 11,000 feet from the bottom of a shaft 180 feet deep. This was a very wet shaft, and there was very great difficulty in seeing down or getting plumb lines steady on account of vibration caused by the pumps. The Great Western Railway Company constructed the heading on the Monmouthshire side by its own officers, and up to the time of the stoppage on the Gloucestershire side, Mr. Oliver Norris, then contractor, had driven 1,680 feet, this heading being driven on a decline of one foot in a hundred. The remaining portion was carried out by Mr. A.

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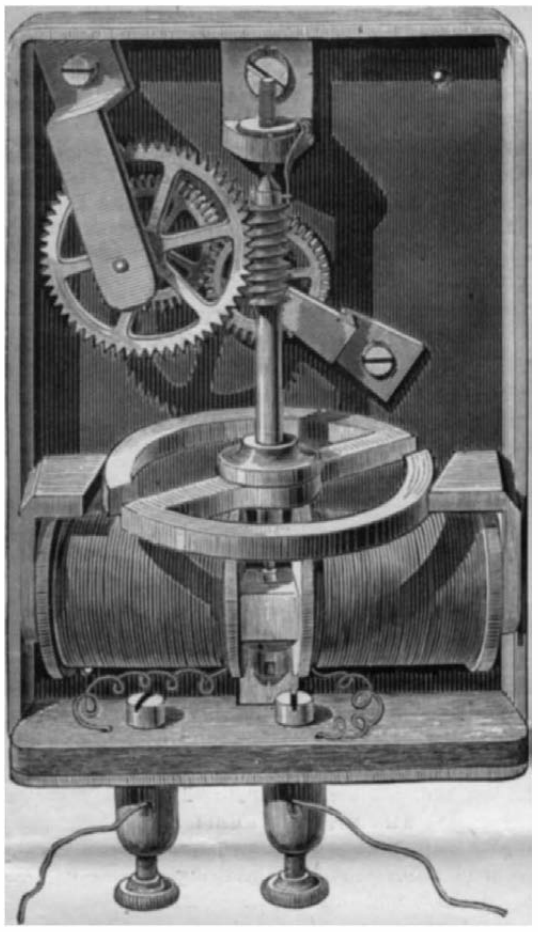
T. Walker, the present contractor. The accuracy with which the lines were taken and the engineering work carried through thus far is, of course, due to the engineering staff—Mr. Charles Richardson, assisted by Mr. A. W. Gooch and Mr. John J. Geach. The land portions of the work remain to be completed, and will, no doubt, occupy a considerable time. The tunnel will also have to be widened to a width of thirty feet, with a proportional height. The completion of the headings is, says the *Engineer*, a fact of great interest from an engineering and geological point of view, and gives every hope that the tunnel will now be completed by Mr. Walker, at a speed which will satisfy even the railway company.

ELECTRIC CLOCK-DIAL MECHANISM.

The construction of a perfect electric clock involves several difficult problems, and it is this which explains in part the existence of a large number of electric clocks varying in



ELECTRIC CLOCK-DIAL MECHANISM.

efficiency according to the attention paid to the fundamental principles which should control their construction.

Electricity actually plays three very distinct characters in the electrical clock, and the Paris Electrical Exposition presents numerous examples of this:

1. Electricity is made use of as a motive power, to swing a pendulum and replace the springs or weights of an ordinary clock.

2. Electricity is employed for transmission. A central clock sends an electric current every second, half minute, or minute, to one or more dials placed at a distance, which causes the hands to advance respectively a second, a half minute, or a minute.

3. Electricity is employed to regulate clocks and dials propelled by ordinary weights and springs, and adjusts the hands every hour, every six hours, or every twenty-four hours. It is this system of synchronism which has been adopted by the city of Paris for the public clocks.

We do not wish to discuss here the respective advantages of the two systems of distribution of time in a city by electric transmission or by electric adjustment effected at fixed intervals. The electric distribution of time has some special advantages which are not possessed by the system of electrical adjustment, and the disadvantages disappear in proportion as the apparatus is perfected and simplified. The pneumatic clock established in Paris two years ago has a transmitter operated by compressed air.

The engraving represents a simple electrical dial mechanism which exactly fulfills the requirements, working surely each minute under the action of the current sent by the central distributing clock.

All of the earlier forms of electrical dial apparatus are operated by an oscillating armature, moved by an electro-magnet and retracted by an antagonistic spring, or two electro-magnets acting upon a polarized armature. The movement of the armature is transmitted to the gearing by the levers and pawls, which must be very perfectly adjusted, as they cease to act if there is a little play, wear, or oxidation. In order to give a slight movement to the armature it is necessary to lengthen the lever immoderately.

All of these inconveniences are avoided in the very simple apparatus of M. Thomas, the mechanism of which is represented in the engraving. It is composed of a horizontal electro-magnet, the poles carrying two armatures, between which is placed a polarized armature in the form of an S, fixed upon a vertical axis. This axis carries an endless screw, which operates the minute hand and gearing. The transmitting clock sends into the electro-magnet alternate positive and negative currents at every half minute. The current sent is such that it develops in the poles of the electro-magnet alternate positive and negative polarity, so that the polarized S-shaped armature is first attracted and then repelled, causing a half revolution of the S-shaped armature for every electrleal impulse. The current should continue from two to three seconds, in order that the polarized armature may be maintained in position. The endless screw carries along the gearing and causes the hands to advance each time.

In consequence of its inertia the polarized S shaped armature tends to pass beyond its half revolution, and the speed acquired toward the end of the half revolution is checked by means of a spring against which a pin carried by the vertical spindle strikes at each half revolution.

This simple and ingenious apparatus requires no regulation. The rotation will be produced, whatever may be the distance from the extremities of the polarized armature to the electro magnet, and this distance may vary from one to two millimeters.

The power of the apparatus is determined by the dimensions of the S shaped polarized armature of the electro-magnet, and by the size and length of the wire which surrounds them.

By using a high tension current of electricity a large number of these electrical dial movements may be placed upon the same circuit and made to operate dials of two meters in diameter.

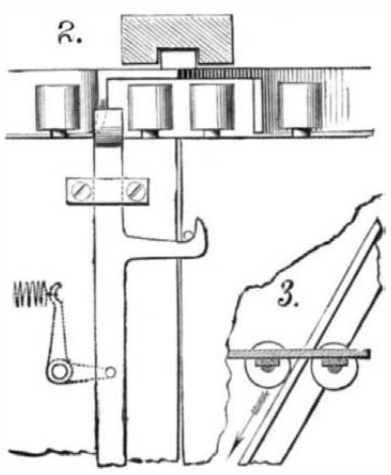
At the Exposition of Brussels, in 1880, where the electric dial mechanism of M. Thomas was in operation for the first time, he had in the same circuit a large dial of 1·80 meters in diameter and eighteen other smaller dials of 0·50 meter and 0·40 meter. They worked perfectly, excepting the five or six interruptions proceeding from the stopping of the transmitting clock caused by the moving of the platform on which the clock was placed.—*La Nature.*

Fire Risks and Tall Buildings.

We have frequently called attention to the fact that modern architecture was the greatest peril with which our large cities is threatened. During the present year, thousands of new buildings are being erected in this city, and of these a large number are tall buildings, seven, eight, and nine stories high, insecurely built from the foundation to the mansard roof, having granite foundations to support cast iron columns, which in turn support iron girders, upon which the floors are laid. Such a building is dangerous for a fireman to enter when a fire is raging within, as the granite foundation is liable to melt away under intense heat, and the iron columns and girders to twist and break, precipitating the floors above, with all their contents, into the basement. Put on top of such a building a mansard roof made of pine, and introduce an elevator shaft to carry the flames almost instantly from one floor to another, and you have a modern death trap that could scarcely be improved upon as a fire hazard, threatening the surrounding buildings and the lives of whoever may venture near it. In the lower part of the city there is one building whose roof is 185 feet above the sidewalk—away out of the city limits—and near by are many others nearly as tall. A fire in that roof would be wholly inaccessible to the firemen, while a high wind would scatter the blazing brands upon the roofs of lower buildings for many blocks.—*Fireman's Journal.*

IMPROVED HATCHWAY DOORS.

The accidents and dangers chargeable to open hatchways are too familiar to our readers to need recital, and it must be acknowledged that the various trap doors, gates, and other appliances in common use for rendering hatchways safe, are deficient in one way or another



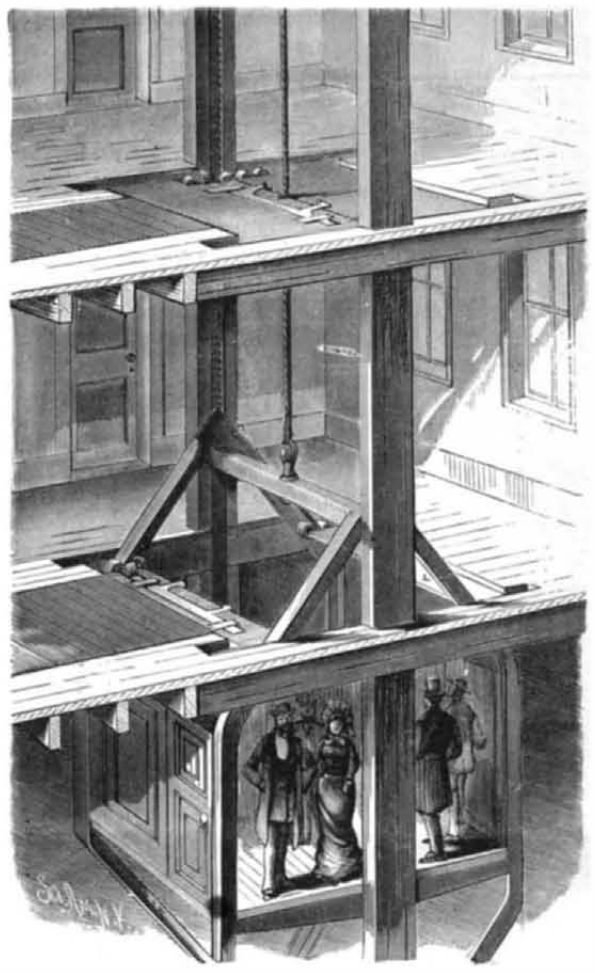
CHAMBERS' AUTOMATIC HATCHWAY DOOR.

Section showing angle irons, rollers, and fastener.

Our engravings represent improved automatic hatchway doors, which are opened and closed by the elevator car as it passes through the floor on which the doors are placed.

The doors are made of heavy boiler iron or of wood, and are placed either under or on the floor, or under the ceiling, as choice or convenience may require, and are so constructed as to easily move or slide horizontally upon rollers or tram-rails. Their operation is positive and automatic. The apparatus is simple, and can readily be applied to any platform elevator already in use. It consists in the attachment of angular irons about the cab or platform so as to form cam braces above and below it, as is indicated in the engraving; and as the platform passes up and down these angular irons run between two wheels or rollers attached to the doors, causing the doors to open as the platform approaches them and close as the platform passes through, making a complete covering for the hatchway—preventing any one from falling through—cutting off draught in case of fire, and when opening conveying safely off any one who may inadvertently stand in the way. Open hatchways become flues, conveying fire and smoke from floor to floor, with uncontrollable rapidity. The improvement shown in the engraving will confine to the floor where the fire originated.

In storerooms requiring heating these doors are found very efficient in preventing the escape of heat from one floor to another. The improvement also prevents the floods of dust and dirt which are constantly pouring through open hatchways.



CHAMBERS' AUTOMATIC HATCHWAY DOOR.

For further information address the Chambers Elevator Company, 145 Central avenue, Cincinnati, Ohio.

Electrical Measures.

At the late Electrical Congress in Paris a committee on electrical units made the following recommendations, which were unanimously adopted: 1. The fundamental units be the centimeter, gramme, and second (C., G., S.). 2. The practical units, ohm and volt, to retain their present definitions. 3. The unit of resistance, or ohm, to be represented by a column of mercury of a square millimeter section at the temperature zero Centigrade. 4. An international commission, to be charged with the duty of determining by new experiments, for practical purposes, the length of the column of mercury, of a square millimeter section at zero Centigrade, which represents the value of the ohm. 5. The name ampère to be given to the current produced by a volt in an ohm. 6. The name coulomb to be the name given to the quantity of electricity defined by the condition that an ampère gives one coulomb per second. 7. The name farad to be given to the capacity defined by the condition that a coulomb in a farad gives a volt. Until something better is discovered than the English candle, the French *Carcel bec*, and the German standard for the measurement of the electric light, preference will be given to the Carcel lamp.

A Can Soldering Machine.

Mr. Henry R. Robbins, of Baltimore, Md., has patented an improved machine for soldering the heads of tin cans to the bodies thereof. In this machine the cylindrical body of the can, having its heads applied, is held in horizontal position, and rotated by vertically moving supports and rotary holders or clamps, while the molten solder is discharged upon the joints of the can heads from an upper receptacle by hollow pistons or chargers which are controlled by the operator. A liquid flux is automatically supplied to the joint and soldering irons brought in contact with the can by the same motion which brings the latter up against the discharge tubes of the molten solder receptacle containing the chargers. A single rotation of the can holders will suffice to secure a firm soldering of the heads to the body of the can, which may then be removed by sliding one of the rotary can holders away from its end of the can. The machine is very ingenious and complete in all its details.

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Manufacture of Paper Pulp from Wood.

The invention of wood pulp has revolutionized paper making and paper prices. It has brought good books, good newspapers, and writing paper within the means of thousands of the common people who could never have afforded such luxuries had rags remained the only available material for papers of good quality. Pulp is made from several varieties of wood, and by both mechanical and chemical processes. A chemical pulp from sound poplar wood has no superior.

In the busy manufacturing town of Manayunk, Pa., a few miles up the Schuylkill Valley from Philadelphia, the operations of wood pulp making may be seen on a large scale, in the extensive works of the American Wood Paper Company, where twelve thousand cords of poplar from the forests of Virginia are annually converted into paper fiber. A description of the manufacture as here carried on will afford a fairly representative idea of the methods of this industry at its best development; while certain accessory details will furnish some indication of its commercial importance.

The mills, which are substantially but plainly built—some of the buildings one and some two stories high—spread over a large area in the outskirts of the village. In the ample yards and along the bank of the canal are always piled several thousand cords of wood. This is cut to ordinary cord wood length, along the York and James and Rappahannock rivers, and having been cleanly barked is cheaply floated up the coast and then up the Delaware River to its destination. Yet so great has been the drain, within a few years, that the supply of first class poplar is already approaching exhaustion in the localities named, and before long the army of choppers will have to shoulder their axes and move farther down in Dixie.

The wood once at the mills the operations of pulp making group themselves into three classes. There is first the mechanical process of cutting the sticks into small chips. The conversion of these into pulp constitutes a second distinct set of operations, while a third, also entirely distinct from the others, includes the preparation of the alkali used in reducing the chips—and the reclamation, for further use, of soda from the liquor that drains off from the pulp. We will look at each in turn.

The chipping is a simple operation, soon done with. A stick is placed in a sloping slide or trough, and its own weight holds its lower end firmly against a set of powerful revolving knives, which rapidly cut it at an angle of 45 degrees, across the grain, into chips five-eighths of an inch thick. These fall into the basement, where boys shovel them into cars similar to those seen for wheeling ore in blast furnaces, and they are taken up by elevator to the second story, to be thrown into the digesters. At this point the chemical processes begin. The digesters are upright boilers, the tops being on a level with the second floor Underneath, level with the ground, are furnaces, while above and behind the boilers, on the second floor, are large iron tanks containing the alkali liquor—strong caustic soda—in which the chips are to be boiled. Each tank has an outlet pipe and stop-cock for discharging its contents into the boiler beneath. At the works we are now describing there are thirteen of these digesters, with their corresponding furnaces and tanks. When a digester is to be filled the cover closing the top is removed and the stop-cock opened, allowing alkali to run and mix thoroughly with the chips which are shoveled in at the same time. When full to the top the packing cover is replaced and secured by a strong bar held firmly in place by a heavy nut screwed down tight. The liquor is soon in vigorous ebullition, and the steam pressure is allowed to reach 100 pounds. In this manner the chips are cooked until reduced to a pulp as soft as the most delicate jelly, every trace of resemblance to its original condition having disappeared.

The contents of the boilers are now blown off into strong iron tanks capable of withstanding the steam pressure in the boilers. From the tanks the pulp and liquor are drawn into what are known as pulp cars. These are simply large vats, with perforated bottoms, and mounted on small wheels, each vat having a capacity equal to that of its adjoining tank. The liquor drains off into tanks prepared to receive it, and clear water is then run through the mass of pulp until all traces of soda are washed out, for every particle of that costly chemical is worth reclaiming for further use. The pulp cars are then run out upon turn-tables, from which they are run down a track to the mixer to be thoroughly mixed with clear water, after which it is pumped into the large pulp chest. From the latter it runs into the two pulp dressers, where any bits of undigested wood are intercepted by screen plates. Leaving the dressers in the form of large sheets, it is immediately torn up and thrown into the bleaching engines, where, through the action of chloride of lime, it is freed from all coloring impurities and left creamy white.

The operations are now nearly complete. From the bleaching engines the pulp is run into the drainers—large vats in the basement—where the chloride of lime is thoroughly washed out. Thrown out from these, the pulp is once more mixed up with clear water, and after passing through a second set of pulp dressers, is run through the 84-inch cylinder machine and over the nineteen driers, which convert it into a strong thick sheet, much resembling blotting-paper, except that the surface is harder and smoother. From the driers it is wound on a long reel, and from the latter it passes between knives that divide it longitudinally into three strips, each of which is wound on a cylinder into a roll of about 118 pounds weight. Nothing remains but to wrap the rolls suitably in packing paper and they are ready for shipment.

The interesting operations of reclaiming soda and making caustic soda remain to be looked at. We noticed that when the pulp, having been reduced in the digesters, was drawn off into the pulp cars, the liquor was drained off and clear water run through the pulp to wash out all traces of soda. This liquor is the original caustic soda, mixed with coloring matters and other chemicals in small proportions, boiled out of the chips. The successive washings, of course, contain the same ingredients, only more and more diluted. All these drainings pass into tanks from which they are pumped to the evaporating house, a large dingy structure across the yard from the pulp making buildings. Here are four furnaces, each fitted with a large evaporating pan so adjusted that the flames pass over the pan on their way to the chimney. The hot gases are still further utilized before being allowed to escape by being passed over another set of pans placed high up toward the roof. The liquor is pumped into these upper pans first, where some of the water is evaporated. It is then run down into the furnace pans, where the balance of the water is evaporated and all vegetable fiber burned out, leaving nothing but black soda ash, which is hauled out and thrown on the ground to cool. Care must be taken not to burn the soda.

A large storehouse stands near by, to which this black ash is taken, and where are also kept white soda ash and lime. Passing from this we enter the alkali house. On the upper floor are ten tanks, into which are put water, black ash, lime, and a small percentage of white ash. Steam is applied and the mixture thoroughly boiled until converted into caustic soda, which is simply the hydrate of soda, or soda held in solution in water. It is then run off into vats and left to stand over night to clarify. A sediment sinks to the bottom composed of lime and the coloring matters of the black ash. The clear liquor is drawn off and is ready for use in the digesters. The sediment is thrown into other vats and water run on it to take up any soda remaining, a process which may be repeated several times. The sediment or waste finally thrown out is of no value.

The capacity of these works is eighteen to twenty tons of fine pulp every twenty-four hours. The product is highly esteemed wherever it has found its way for its superior quality. Large quantities are lately being shipped to France. The works were originally run by water power, but the frequent recurrence of low water compelling a shut-down of eleven or twelve hours out of every twenty-four, has led to the introduction of steam. The pulp department is now driven by two fire engines of 250 and 125 horse power respectively, and the water which still turns the machinery of the alkali department will soon give way to its more reliable rival. Twenty-five thousand tons of coal are already consumed every year in the furnaces, an amount which will, of course, be greatly increased now that it is also used for motive power.—*Paper World.*

Industrial Mortality.

An English statistician has lately brought out the following fact, which, it is claimed, is a discovery and a fit subject of legislation. It appears that 107,000 men, women, and children have lost their lives or been injured in English mines and factories, on railways, and by boiler accidents during the four years preceding 1877, and on this basis, it is estimated that half a million workmen will lose their lives in ten years—300,000 in mines, 70,000 on railways, and 130,000 in factories.

Another writer sets the figures at a full million, or 100,000 persons per annum in England alone, killed from causes in connection with the industrial occupations in which they are engaged. As much as six-tenths are ascribed to mining accidents. This aggregate is sufficiently appalling, and ought to be inquired into in this country as well as in England, but it is difficult to prescribe efficient legislative measures to meet the case.

It is probable that the diffusion of technical knowledge among all classes of laborers and artisans, and especially the foremen and managers of industrial establishments, would do more than laws, not only to decrease the number of violent deaths, but to ameliorate the sanitary condition of all establishments where tools or machines of any kind are used. The well lighted, well aired, and roomy workshop or factory, moreover, promotes the production of more and better products than can be expected from dark, damp, and dingy cellars and crowded, ill-ventilated, dirty shops in densely packed neighborhoods. Even the dismal mine may be much improved by the electric light and more efficient ventilating appliances, and the natural result is more safety, better health, and a greater yield, so that once understood no thoughtful manager will need to be driven by law into the adoption of sanitary means.

Steel Breastplate.

Some interesting experiments have been lately carried out in Leipsic with a cuirass made of a newly invented preparation of steel. The metal of the cuirass is only about three-fiftieths of an inch thick, and is lined inside with a thin layer of wool. The cuirass itself is 14 inches wide and 10 inches high, being intended only to protect the heart and lungs, and weighs 2¼ pounds. Eleven rounds were fired at it at a distance of 175 yards from a Martini breech-loading rifle, and of eight bullets which struck the cuirass only two pierced the metal, while even these were completely flattened and remained in the woolen lining, so that a man wearing the cuirass would have been uninjured.

ENGINEERING INVENTIONS.

An improvement in railway air brakes has been patented by Mr. Clarence L. Lorraine, of Oronoco, Minn. The invention consists in a novel arrangement of hanging bars, connecting rods attached to brake beams, and an expansible and contractible air chamber.

Mr. Dyson D. Wass, of San Francisco, Cal., has patented an improved device for removing air and grease from feed water. The invention consists in a chamber into which the pipe from the feed pump conducts the feed water, this water being drawn from this chamber below the surface, so that the oil and grease which rise to the surface of the water cannot leave the chamber with the water. As the air forced into this closed chamber is compressed therein and forces the level of the water downward, a float valve is provided, which opens an air cock to allow the air to escape as soon as the water level drops to a certain extent.

An improved steam engine governor has been patented by Mr. John W. Peck, of Evansville, Ind. This invention relates to devices which are more particularly intended for use in connection with what is known as the "Corliss engine," the object being to provide means for quickly stopping the engine in case of accident. The improvement consists in the combination, with the cut-off valve gear, of one or more independent stop cams, located on the same moving part with the cut-off cams, and a detachable connection with the governor, which transmits the normal action of the governor to the cut-off cams, but which at will may be broken to allow the stop cam to throw the cut-off gear out of action and stop the induction of steam.

Cheap Antiseptic and Disinfectant.

Prof. Beilstein has made comparative experiments with disinfectants, to determine their relative value as such. He arrives at the conclusion that aluminum sulphate is an effective and at the same time the cheapest substance arresting putrefaction. If sufficient time is given for its action (two to three days), a four per cent solution will effect more than a fifteen per cent solution of ferrous sulphate, thereby counterbalancing any difference in price in favor of the latter. Besides, a very crude article might be manufactured from clay and sulphuric acid, which would be very cheap indeed. A four per cent solution of aluminum sulphate will kill all infusorial life, no matter how tenacious. However, this substance has no power of destroying putrid odors, and for this carbolic acid seems to be the only available article. The author inclines to the belief that this disinfectant does not merely supplant foul odors by its own, but that the phenol enters into actual combination with the skatol of the fæcal effluvia. He therefore recommends aluminum sulphate, combined with a little phenol, as the most effectual as well as economical for rendering decaying organic substances both odorless and innocuous.—*Pharm. Centralh. from Deu sche Viertelj.*

Braga Beer.

This is a kind of beer brewed in Russia. C. O. Cech, the editor of the *Russian Brewers' Record*, gives some interesting particulars of the primitive system of brewing adopted in preparing it. In order to obtain 25 wedros (about 2 barrels) of beer, 1 sack of corn, 40 lb. of malt, and 3 lb. of cultivated, or 5 lb. of wild hops, and 40 wedros (about 3 barrels) of water are taken. The whole of the corn and malt is placed in a wooden vat and treated with 30 wedros (about 2¼ barrels) of boiling water; in the meantime the hops are boiled in a copper. In a second vat a layer of straw is spread over the bottom, the latter being provided with a small opening into which a long rod is fixed, which is used as a stop valve. The steamed hops are then brought into this vat, and the sweet wort and boiling water added. The rod is then drawn up, and the hopped wort filters through the straw into a tub. It is again warmed, then brought in contact with the hops and filtered, and this operation is repeated till a clear liquid of aromatic smell has been obtained. One liter (about 1 quart) of yeast diluted with 4 wedros (about 10 gallons) of warm water is now added to the wort, and the whole allowed to ferment for two hours. The beer is then transferred to casks and left to ferment in a cool place, the yeast escaping through the vent hole. After two or three days the vent peg is fastened firmly into the cask, and the beer is ready for use shortly after this time, but it is considered preferable to bury the casks in hay for a short interval. By this treatment the quality and brightness of the beer are considerably improved.

A Prolific Ewe.

Mr. A. Chartraud, of Matanzas, Cuba, reports, in a communication to us dated September 27, the following remarkable behavior of one of his ewes. On the 3d of January last this ewe gave birth to a lamb, which appeared to be strong and healthy, but died in about a fortnight. The ewe appeared to be still with lamb. On the 8th of February she dropped another lamb, which lived and throve. On the 13th of March she dropped two lambs, both living. In September she was again with lamb, and on the 10th she dropped a strong and healthy one. On the 26th she dropped another; and when our correspondent wrote, the next day, she was apparently still "full."

Mr. Chartraud adds: "I have visited numbers of sheep owners, but no one has ever witnessed such a departure from the natural order of things. This makes the sixth lamb since the beginning of the year. I have heard of a foal of four lambs, but all in the same day or period of birth."

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THE CONDOR.

The condor is a native of the mountain chain of the Andes, and is one of the largest of the birds of prey. The average expanse of the condor's wings is from eight to nine feet, and the length of the body from the point of the beak to the extremity of the tail three feet and five or six inches.

The color of the condor is a grayish black; the wings are marked with white, and there is a collar of downy white feathers about the neck. The crest of the male is quite large. The internal structure of the condor presents some curious features; the "gizzard" is provided with longitudinal rows of horny spikes. which are supposed to assist the bird in the rapid digestion of its food.

These birds often attack cows, bulls, and deer, and as their assaults are chiefly directed upon the eyes, they blind their victims, and they soon fall by the blows which are inflicted upon them by the beaks of the birds.

The condor is very strong, and even when wounded a powerful man is no match for one of these creatures.

The Indians have a great dislike to these birds, and if they capture one of them alive they torture it very cruelly. Their mode of capture is as follows: They kill an animal and expose the body in the open air. The condors soon assemble in large numbers and feast upon the flesh. As soon as they are gorged to the full the Indians dash in among them and capture them with their lassos. When they feel the noose around their necks they endeavor to reject the meal which they have swallowed, but are made captives before they are able to rid themselves of the food.

The flight of these birds is grand and beautiful; they seem to fly by moving the head and neck rather than the wings.

Although there have been condors in the Zoological Gardens at Dresden since 1874, it is only recently that anything has been found out in regard to the length of the brooding season, their habits at the time, their manner of feeding their young, etc.

Very little has been known of the habits of these birds until lately, as they live at a height of from 10,000 to 15,000 feet, and only come down to the lower points in search of prey. The Indians assert that the eggs are laid upon the bare rock, the bird making no nest whatever.

The condors in Dresden commenced laying in April, 1877, and, after that, laid from two to three eggs yearly in April or May, but unfortunately they crush their eggs immediately, or after playing with them several days. Last year a nest of dried branches, feathers, and wool was made in the top of the cage, about two meters from the ground, and it was thought that the birds would avail themselves of it. Loose material for nest-building was also put in the cage, but the female laid her eggs in the sand as before, and both the eggs were soon destroyed. The same thing happened this year in the middle of April. Shortly after the birds were removed into the large summer quarters of the birds of prey, and the female laid an egg on the 9th of May, in a dark corner of the cage. The next day the male commenced to brood. All the materials for a nest that the keeper laid under and about the egg were rejected and scratched away, and the brooding went on upon the gravel bottom of the cage. The male devoted himself to the brooding the greater part of the time, the indolent female only setting upon the egg about a third of the time.

On the seventh of July, after nearly eight weeks, the keeper announced that he had discovered life in the egg, and on the same day a rent was perceived in the shell. The next day the bird had almost escaped from the shell, only the head and neck remaining in, and on the following day the bird was entirely freed. Since then the old birds have been very busily employed in giving the little one the necessary warmth, and have manifested equal anxiety in feeding it with horse flesh and small pieces of cat and dog flesh. The little fellow, with its grayish feathers, looks something like a young owl. Its head and neck are quite black. If any one approaches, it commences already to utter angry cries, and the old birds are so ugly that the keeper can only enter the cage armed. The brooding continued for eight weeks less one day. Cassel says, in his "Natural History," that a condor's egg was hatched in six weeks and two days by a hen. This may be on account of the nest which the hen had.

The young bird, on the first day, measured ten centimeters in length, and on the twentieth day twenty-eight centimeters. The condors are fond of bathing, and often sit upon their eggs with their wet feathers.

New Zealand Fungus Trade.

During recent years the exportation of the edible fungus. *Hirneola polytrichia*, has become an important industry in New Zealand. This fungus is saucer-shaped, three to seven inches in diameter, dark reddish brown on the inside when dried, and gray on the outside. It is said that the odor of these plants distinguishes them for botanists, but their chief peculiarity is their growth. They spring up, it is believed, by hundreds and thousands in a night, being produced, not from seed, but by a spawn which bears organs of fructification. Another peculiarity is that they absorb oxygen and give out carbonic acid, like animals, while other plants absorb the latter and give out the former. The commercial fungus of New Zealand is found in the North Island, on various kinds of decayed timber, all the fungi, as is well known, favoring damp situations. Nine-tenths of the Province of Taranaki, 80 miles by 70 in extent, where it is found, is densely wooded. The plant is found in what are called new bush settlements, made by laboriously clearing. The branches are lopped off and burned, the trunks, resting on their own spurs and sometimes on scaffolds built for them to fall on, begin to decay—not lying prone on the ground—and the fungus grows. It is prepared simply by letting it dry. China is its market, and it was at first bought up by collectors for a cent per pound, and sold in San Francisco for fifteen and in Hong Kong for twenty-three. According to the Colonial Secretary of Hong Kong, the fungus is much prized there as a medicine, administered in the form of a decoction, to purify the blood; it has also been reported to be in use in China and Japan as a dye for silks. But its principal use among the Chinese is as an article of food; it forms the principal ingredient in their favorite soup, for which it is highly regarded on account of its gelatinous qualities and its rich flavor.

Peanuts.

Although the peanut merchant, with roasting mill, may be seen on almost every block in American commercial centers, but few of those who pay their nickel for a heaping measure of these hot ground nuts have any idea of the extent of the trade in bushels or its value in dollars. According to the Cincinnati *Price Current*, the crop this year will be less than half what it was last year. It then amounted to 2,370,000 bushels, valued at $2,150,000, about two-thirds of which came from Virginia. Of the balance, 750,000 bushels came from Tennessee, and 120,000 bushels from North Carolina.

Nickel Plating.

A simple process of nickel plating by boiling has been described by Dr. Kaiser. A bath of pure granulated tin tartar and water is prepared, and after being heated to the boiling point, has added to it a small quantity of pure red-hot nickel oxide. A portion of the nickel will soon dissolve and give a green color to the liquid over the grains of tin. Articles of copper or brass plunged into this bath acquire in a few minutes a bright metallic coating of almost pure nickel. If a little carbonate or tartrate of cobalt is added to the bath a bluish shade, either light or dark, may be given to the coating, which becomes very brilliant when it is properly polished with chalk or dry sawdust.

THE CONDORS AND THEIR YOUNG IN THE DRESDEN ZOOLOGICAL GARDEN.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

A Civil Engineer, for many years resident in South America, a good linguist, desires employment in his profession, or as representative of engineering firms abroad. Address A. B., P. O. Box 773, New York.

Beaumont's Draught Apparatus. See page 291. State and county rights for sale.

Carbon Plates and Pencils. 48 R. R. Ave., Jersey City, N.J.

Leather Belting, Rubber Belting, Packing and Hose Manufacturers' Supplies. Greene, Tweed & Co., N. Y.

New Book.—A Treatise on Iron Founding. By Claude Wylie. Written for practical men. Illustrated. $1.40. Send for our catalogue of scientific books. E. & F. N. Spon, 446 Broome St., N. Y.

Garfield and Family.—Elegant engraving, 19 x 24, sent for 24 cents (stamps). Sheehy & Co., 33 Barclay St., N.Y.

Don't fail to see the New Automatic Engine built by the Lambertville Iron Works, now in operation at the American Institute, New York.

Address Penfield Block Co., Lockport, N. Y., for Pulley Blocks, Sheaves, Store and Baggage Trucks, Hand Hoists, Car Pushers.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 285. Totten & Co., Pittsburg.

Farmers desirous of utilizing the immense crop of apples this country will undoubtedly be blessed with during the present year, and thus realize a large amount of money, should at once send to Messrs. Boomer & Boschert, 15 Park Row, New York, for their illustrated circulars, with prices, which are reasonable.

Blake's Belt Studs. The best fastening for leather and rubber belts. Greene, Tweed & Co., 118 Chambers St., N.Y.

Mechanics' Watch, $10. Circul's free. Birch, 33 Dey St., N.Y.

Second-hand Upright Engine, in excellent order, for sale. 6 to 8 H.P. Trump Bros. Mach. Co., Wilmington, Del.

A pair of 15 x 24 Engines, good as new, for sale cheap, as they must be removed. J. C. Todd, 10 Barclay St., N.Y.

Foot Lathes, Fret Saws, 6c. 90 pp. E. Brown, Lowell, Mass.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Cope & Maxwell M'f'g Co.'s Pump adv., page 254.

Punching Presses & Shears for Metal-workers, Power Drill Presses, $25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N.Y.

Machine Diamonds, J. Dickinson, 64 Nassau St., N.Y.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro. 234 Broadway, New York.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Peck's Patent Drop Press. See adv., page 269.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N.Y.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Electric Lights.—Thomson Houston System of the Arc type. Estimates given and contracts made. 631 Arch, Phil.

Saw Mill Machinery. Stearns Mfg. Co. See p. 269.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 268.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Improved Skinner Portable Engines. Erie, Pa.

The American Electric Co. and Proprietors and Manufacturers of the Thomson Houston System of Electric Lighting of the Arc Style. New Britain, Conn.

See Bentel, Margedant & Co.'s adv., page 285.

For the best Diamond Drill Machines, address M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Clark & Heald Machine Co. See adv., p. 286.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 286.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Gould & Eberhardt's Machinists' Tools. See adv., p. 286.

The Medart Pat. Wrought Rim Pulley. See adv., p. 285.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 286.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 285.

Engines, 10 to 50 H. P., $250 to $500. See adv., p. 286.

Barrel, Key, Hogshead, Stave Mach'y. See adv. p. 285.

Drop Hammers, Power Shears, Punching Presses, Die Sinkers. The Pratt & Whitney Co., Hartford, Conn.

Pays well on small investment.—Stereopticons, Magic Lanterns, and Views illustrating every subject for public exhibitions. Lanterns for colleges, Sunday schools, and home amusement. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., N. Y.

Safety Boilers. See Harrison Boiler Works adv., p. 285.

Telegraph, Telephone, Elec. Light Supplies. See p. 285.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

Supplee Steam Engine. See adv. p. 270.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 286.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

4 to 40 H. P. Steam Engines. See adv. p. 254.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Av., Phil. Pa.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

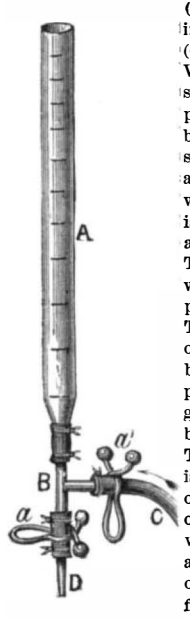
(1) A. W. P. asks: Will you please give your readers some facts in regard to kerosene lamps and oil? Is it essential that a kerosene burner have any air vent? I have one that has no perceptible vent, yet it burns beautifully. I have another that has a hole big enough to run a No. 8 wire through it to the oil; that lamp sings and flickers, and when I blow it out it will fluctuate several times before it will go out. Now, is not that lamp dangerous? I would stop the vent if you think it advisable. Why does a lamp sing and why it flickers in a close room where there is no draught of air to disturb it? If the socket that fits on to the lamp gets so hot that it burns your fingers, is it not dangerous? If the oil will not flash up when a match is thrown into it, but burn for several seconds before the oil takes fire, is that oil a safe oil to burn, or had the oil ought to be as hard to ignite in the same manner as lard oil? Can you inform us whether there is any sign of danger from a lamp preparatory to its exploding? A. All kerosene burning lamps should be provided with some kind of air vent, but it is not desirable to have too large a vent. In some the aperture formed by the wick wheel is all sufficient; in others a small flat vent tube is soldered to the side of the wick tube. If the vent is too large a slight disturbance of the oil causes flickering. The "singing" and flickering may be due to an imperfect air supply, poorly fitting wick or chimney. As ordinarily constructed the brass burner and collar of lamps often get heated to 100° Fah., or over, especially if allowed to burn low for several hours. If good oil is used there is little danger attending this. With regard to what constitutes good burning oil and what are the conditions of safety in using it, see Non-Explosive Kerosene, page 112, current volume.

(2) C. A. B. speaks of his saw mill. I would say that a large amount of his power is lost in driving so much useless gearing. A thirty-five inch Leffel wheel making some 100 to 140 revolutions, if the water is clean and free from anchor ice in winter, may be fitted with a bevel mortise (wooden cogged) wheel on its shaft of four feet or more in diameter (better larger so as not to get the pinion too small), working into an iron pinion of one-fourth or fifth on the saw mandrel, and do good work, if only driving the saw, and its appurtenances. He may drive his 48-inch saw 700 revolutions or more to do the best work. I know of a saw thus rigged doing fair work with only ten feet head. Of course more head would be better.

(3) W. A. writes: I am in business here and am under considerable difficulty regarding the best mode of heating tires for cart and other wheels. Would you please, through your valuable columns, explain the best sort of furnace for the purpose? A. Heating tires for shrinking on wheels, as generally practiced here, is by laying the tire on a large cast iron plate with a hole cut out of the center, say 2½ feet diameter; a wood fire is then built all over, and covering it and kept burning until properly heated.

(4) L. H. C. says: I want to make T's out of India-rubber tubing. What kind of cement can I make the joints with? How must the cement be mixed? A. The cement commonly used by rubber manufacturers for piecing rubber goods is prepared by dissolving purified gum rubber in benzine. The benzine may be put into a large, narrow necked bottle, and this suspended in a vessel of warm water (away from fire). The rubber is added gradually with occasional agitation until a liquid of the consistence of thick molasses is obtained. The parts to be joined are thinly but uniformly smeared over with this, and exposed to the air for a few minutes before bringing the pieces together. The joint should be placed under pressure in a warm place for forty-eight hours or more before using. Gutta percha cements, also marine glue, can often be advantageously employed in place of the rubber cement. See Cements, page 2510, SUPPLEMENT, No. 158. Where the joint has to sustain rough handling or strain, it is usually preferred to insert in the joint a thin T-joint of hard rubber or metal.

(5) F. A. W. asks for the simplest method (or the usual method) of filling a large number of small (one-eighth ounce) bottles. When the bottle is opaque, I should suppose something to permit only enough to fill the bottle flow out would be necessary. A. One of the simplest arrangements for filling vials with liquid is the following: A is a piece of glass tubing graduated as to contents by file marks. The lower end, drawn out somewhat, is connected by a short piece of rubber tubing with the T-shaped glass tube, B, the other limbs of which are closed by rubber tubing and spring pinch cocks, *a a'*. D is a small glass delivery tube, connected by the rubber tubing with B. The end of the rubber tube, C, is connected with the reservoir of liquid, so that when *a'* is opened and *a* closed, the liquid will flow into the graduate, A, and when *a'* is closed and *a* opened, a measured quantity flows out through D into the vial.



(6) G. A. H. asks: 1. Is the current from a dynamo electrical machine as at present made capable of decomposing water with the same facility as the galvanic current? A. Yes. 2. How many cubic feet of each gas could be produced by a small machine, say, one-half horse power, per hour? A. It would depend altogether on the construction of the machine. 3. Providing the latter could be run by water power, storing up the gases during the day, could not the calcium light be produced for evening use almost without expense? A. This is impracticable.

(7) F. R. F. asks: What gum is used in the preparation of the so-called "ready mixed or patent" paints? A. You should send a labeled sample of the paint referred to.

(8) W. A. T. asks: Will you please explain why the symbol for nitric acid is "A_2O_5HO," instead of "N_2O_5HO," in the article on the "Manufacture of Oxygen from the Air," in your issue of October 1, 1881, on page 4784? A. It should read "$N_2O_5H_2O$," or "$(HNO_3)_2$" and not "A_2O_5HO."

(9) C. E. S. asks: 1. Will sulphate of copper cell, four quart size, answer for electroplating small articles? A. If the objects to be plated are small, such a battery will answer. 2. Can plain work done with such battery be burnished with an ordinary burnisher? A. Not very well. Gold and silver can be deposited so as not to require burnishing. Electroplated work is usually finished by buffing. 3. How expensive are the batteries such as you described in a recent number of SCIENTIFIC AMERICAN as capable of maintaining one arc light with flannel envelope, etc.? A. Such a battery can be constructed for $20. 4. Can it be used for electroplating? A. Yes, if properly adjusted to suit the requirements of the work.

(10) O. P. L. asks: 1. Can water be heated higher than 212° Fah., under any circumstances? A. Yes; we do not know that there is any limit to the temperature to which it can be raised under pressure. 2. If a belt be connected from a fly wheel of an engine to another wheel of same diameter on a shaft the same diameter as the engine shaft, which shaft will bear the most resistance? A. The shaft of the prime mover.

(11) E. S. asks: 1. How can I make a mucilage for gumming the backs of labels to prevent them from cracking when dry? A. Try the following: Gum dextrine, two ounces; water, five ounces. Heat the water to boiling, and gradually sift in the powdered gum and stir until all is dissolved. If the solution is not thick enough on cooling, add more gum—and *vice versa*. It should not be too liquid. Dampen the paper well before gumming. Put under strong pressure when dry. See article on Postage Stamps, page 212, current volume. 2. How can I silver articles that have already been silvered, but from which the silver has worn off? A. For information on silverplating see silver deposit, p. 81, vol. 44. 3. The proportions of tartaric acid and bicarbonate of soda for making soda water? A. Common lemon soda, without a machine, is prepared as follows: Put into each bottle 2 drachms of sugar, 2 drops of essence of lemon, half a drachm bicarbonate of potash, and water to fill the bottle; then drop in 35 or 40 grains of tartaric or citric acid, and cork immediately, placing the bottles in a cool place, or on ice.

(12) W. G. L. asks: 1. What are the ingredients, and how is the cylinder oil known as "valvoline" made? A. We are unable to give you the composition of the lubricant. 2. Is it a patented article? A. We believe not. 3. Are the substances known to oil dealers as French de gras and French grease the same thing, and where and from what are they made? A. Yes.

(13) D. F. asks: Will you please tell me how so-called cameo painting on glass is done—I mean the kind that is done between two pieces of convex glass, and the picture appears larger than the one it was taken from? A. The transparent colors used are Prussian blue, gamboge, carmine, verdigris, madder brown, indigo, and crimson lake. The semi-transparent include raw sienna, burnt sienna, cappah brown, and Vandyke brown. The vehicles used are oil, megilp or gum water, or warm gelatine solution. With the latter some of the coal tar dyes are available, but though producing rich effects, most of them are apt to fade on exposure to light. The colors are applied with a camel's hair pencil. The magnifying effect is due to the lense-shaped glass covers.

(14) F. J. M. says. Referring to your reply to R. E. M., describing method of taking cast of human face, how are the eyebrows, lashes, and the long hair of a female subject prepared so as to keep them from bedding into the soft plaster? I hardly think that oil would be sufficient. A. Smooth the hair as evenly as possible, moisten the surface with gum tragacanth water, and when this has dried, oil. Wax and soap may also be used.

(15) H. C. asks: Will you please state how much I can practically compress a gas without changing its nature? To explain: suppose I have a vessel of one cubic foot capacity, how many cubic feet of gas can I force into said vessel? A. Pressure does not alter the nature of gases. A gas may be compressed up to its point of liquefaction. A pressure of a few atmospheres is sufficient to liquefy some of the gases, while others remain in the gaseous state (at ordinary temperatures) under pressures equal to twenty tons per square inch.

(16) E. L. W. asks: Can you inform me how water glass is made and how the sirupy solution of water glass is prepared? A. You will find the information required in article on Water Glass, page 16, No. 2, current volume.

(17) E. H. L. says: I have just painted an iron fence with a paint composed of boiled linseed oil, asphaltum and naphtha. The work showed at first a very brilliant black coat. The first rain colored it dirty brown, destroying the gloss. Can you suggest any addition—inexpensive preferred—to retain in a measure the gloss on exposure to the weather? I have always understood asphalt to be much better than coal tar. The work was perfectly dry before it was touched by the rain. A. We know of no cheap substance the addition of which would make the gloss permanent. Lampblack will make the paint blacker. Such paints or varnishes are greatly improved by boiling the oil and bitumen together for twelve hours or more before thinning down for use. A good iron work black is prepared as follows: Put forty-eight pounds asphaltum into a capacious iron pot, and heat to boiling for four hours; during the first two hours introduce seven pounds of red lead, seven pounds of litharge, three pounds of dried copperas, and ten gallons of boiled linseed oil; add one eighth pound run of dark gum, with two gallons of boiled oil. After pouring the gum and oil continue the boiling for two hours, or until a sample of varnish will roll up into hard pills when chilled. When cooled somewhat take it out of doors and thin down with about thirty gallons of oil of turpentine. 2. What substitute cheaper can I get for outside ink in place of boiled linseed oil? Some drying oil, I suppose, is needed. A. Linseed is the best and cheapest oil for this purpose.

(18) J. H. asks: Will you please inform me of the best method of preparing cloth so that by placing it between two sheets of writing paper and writing on the top sheet with a pencil or other sharp instrument it will make a copy on the under sheet? A. Manifold paper is prepared as follows: Mix with cold lard a sufficient quantity of lamp black or fine ivory black to produce a thick smooth paste, smear this over the cloth (or paper unglazed), rub it in with a cloth pad, and then rub off any excess with a piece of flannel. For blue use Prussian blue instead of the black pigments, for green chrome green, for red cochineal or vermilion.

(19) D. C. asks: Can you give us a good recipe for enameling or porcelain lining for iron hollow ware such as wash bowls, sinks, etc.? A. Flint (quartz), calcined and ground, one hundred pounds; borax glass (anhydrous borax) ground, fifty pounds. Mix, fuse together in a crucible, and let it cool slowly. Powder and mix forty pounds of this glass with five pounds of kaolin (white potter's clay), and grind the mixture to a fine paste in water; pickle the vessel in dilute sulphuric acid, and scour with sand to thoroughly cleanse its surface; then line it with a coating of the above paste about one-sixth of an inch thick, and let it stand in a warm room until the coating has partially dried. Next dust over the surface of the paste coating (still moist) the following powder, and dry in an oven at 212° Fah.: White glass, free from lead or arsenic, one hundred and twenty-five pounds; borax, twenty-five pounds; carbonate of soda, fused, powdered, moistened with water and dried, twenty pounds. To forty-five pounds of this add one pound soda. Mix thoroughly with a little hot water, dry, and reduce to fine powder. When the coating on the iron has dried, the vessel is put in a muffle and the heat gradually increased until the glaze fuses, when it is taken out, more glaze powder is dusted on, and after a second heating allowed to cool very slowly. Some of the glazes employed consist of variable mixtures of feldspar, sodium carbonate, borax, and oxide of tin. Feldspar is also sometimes added to the enamel body.

(20) W. F. S. asks: What can I use on polished brass to prevent tarnishing, etc.? Is there anything better than alcohol and shellac? A. See Lacquers for Brass, page 209, vol. xliv.

(21) A. B. says: I have a lot of nearly dry alcoholic fruit and root extracts. Could these be used advantageously for fertilizing purposes in an orange grove? If not could anything be added to them that would make them available for the purpose? A. Such extracts contain nothing that would make them valuable as fertilizers, and we know nothing that can be added to them that will make them specially useful for this purpose.

(22) E. D. S. asks: Would three gravity batteries placed in a cellar where there is milk make it sour? A. No.

(23) H. L. writes: I am running an engine of 20 inch bore and 36 inch stroke about 55 to 60 revolutions per minute with 65 to 70 pounds steam pressure. Said engine has a valve at each end, and the ports are 10 inches wide and open one full inch. The steam pipe is 5 inches in diameter. Are the ports in proportion to the size of engine as also to the steam pipe? A. We think both your ports and steam pipe should be at least one half larger, and would be better if double the present size.

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(24) Dr. F. A. R. asks: Will you please inform me through the Notes and Queries column of your next issue, with what should bone ash be mixed, and also directions for making a bone ash cupel, as shown in SCIENTIFIC AMERICAN, May 28, 1881, page 339? Can bone ash, good enough for making cupels, be prepared by burning bones and grinding? By passing a stream of H_2S into $(NH_4)OH$ (spec. gr. 0·96) until saturated, and then adding an equal volume of $(NH_4)OH$, will it not give $(NH_4)_2S$? What is the difference in the preparation of $(NH_4)SH$, $(NH_4)_2S$, and $(NH_4)_2S_2$? I noticed in the tests for metals of the different groups in a qualitative analysis which I have, that some of the tests require one of the above reagents and some require another, and I wish to ask if it is necessary to have all of the reagents, or will the ammonic disulphide answer in place of the others? A. Take bones or bone black and calcine them in an open crucible until all the animal and carbonaceous matters have been destroyed and the residue becomes whitish; cool and empty the contents of the crucible into clean water, and give it repeated washings in fresh waters to remove all soluble matters. Drain on a filter and dry. When required for use moisten with water (or beer) in about the proportion of eight of ash to one of liquid. It is then ready for the mould. When moulded the cupel must be dried slowly by the stove, then heated in the muffle to bright redness before it receives the charge. There are two or three points to be observed in making the best cupels: First, the powdered bone ash must be of a certain degree of fineness; secondly, the paste must be neither too soft nor too dry; and thirdly, the pressure must be made with a certain degree of force. A coarse powder only slightly moistened and compressed furnishes cupels which are very porous and break on slight pressure, and which allow small globules of metal to enter their pores occasioning loss. When the powder is too moist and too strongly compressed the cupel does not absorb readily—soon becoming choked or clogged—and requires too high a temperature to complete a cupellation. The action of hydrogen sulphide upon ammonia gives rise to the formation of $(NH_4)_2S$, [$2NH_4(OH)$ and $H_2S=(NH_4)_2S$, and $2(H_2O)$], then of NH_4SH; upon addition of the same quantity of solution of ammonia as has been saturated, the ammonia decomposes with the ammonium hydrosulphide and ammonium monosulphide is formed thus: $NH_4SH+NH_4OH=(NH_4)_2S+H_2O$. The rule is, however, to add only two-thirds of the quantity of solution of ammonia, as it is better the preparation should contain a little ammonium hydrosulphide than that free ammonia should be present. To employ ammonium hydrosulphide instead of the monosulphide is unnecessary.

(25) F. R. E. asks: Will you inform me why it is that the water always rises in all the small streams in the fall? A. We think you are mistaken in your premises. Streams rise in the fall and spring after rains; but we think that during this fall the drought has diminished the streams.

(26) G. E. T. asks: 1. What is the battery power required to run an Edison lamp? A. From 100 to 140 cells of carbon battery. 2. Will any part of the secondary battery need renewal after continued use? A. The acidulated water is liable to become decomposed. In other respects we think the battery is permanent.

(27) A. F. W. asks: 1. Is the current generated by a dynamo electric machine always of exactly the same strength for the same speed of the machine? A. Any variation in the resistance of the external circuit will change the strength of the current. 2. Can the difference in strength be made noticeable for a change in speed of five revolutions? A. Yes. 3. What is the most practical and reliable instrument for observing the changes in strength, due to changes in speed? The generator is supposed to be one of the smallest sizes that can be had. A. A galvanometer placed in a shunt circuit.

(28) C. B. B. writes: I made a Holtz electrical machine from directions in SUPPLEMENT, No. 278, and am unable to charge it. I used tin foil, well insulated about the edges, for inductors, and the revolving plate does not turn quite true. If you can give any information that will help matters you will greatly oblige. A. A Holtz machine will not work in sultry summer weather. If your machine is made according to directions given in the SUPPLEMENT it will work well most of the time from now until warm weather in the spring.

(29) W. M. B. asks: Why is it that some banks do not take gold and silver coin that has holes punched in it, or is mutilated in any manner? What is the value of it in that case? A. There is no provision for the redemption of mutilated silver coin, and as it is not a legal tender, and has a value as bullion only, bankers and others are justified in refusing to redeem it. Mutilated gold coin is a legal tender at a valuation in proportion to its actual weight, according to Section 3585 Revised Statutes, which provides that: "The gold coins of the United States shall be a legal tender in all payments at their nominal value, when not below the standard weight and limit of tolerance provided by law for the single piece, and when reduced in weight below such standard and tolerance shall be a legal tender at valuation in proportion to their actual weight." This section seems to have been overlooked or ignored by the banks and treasury officials, but we presume now that so much interest is taken in mutilated coin that arrangements will be made to retire mutilated gold coins.

(30) E. L. C. asks: Will you please inform me where I can obtain any knowledge concerning the liquefaction of the so-called permanent gases O, H, N, by Cailletet of Paris, and Pictet of Geneva, in 1877. A. See pp. 2030–31, SUPPLEMENT, No. 128, also SUPPLEMENTS, Nos. 116 and 118, and SCIENTIFIC AMERICAN, vol. xxxviii, pp. 64 and 73, 111 and 186.

(31) R. L. N. writes, in answer to O. R. M: I have effected nearly a complete cure for dandruff, by washing with a solution of borax once each tenth day, and using bay rum each alternate day. At first use it every day.

(32) H. H. W. asks: Is there any method of closing an electric circuit through the agency of light? A. It can be done by means of a selenium cell, or by some modification of the radiometer.

(33) J. W. K. asks: What power in tons will it take to punch one inch round hole through one inch iron? A. From fifty-five to sixty-five tons, depending upon the quality of the iron.

(34) W. R. M. writes: My residence is about 200 feet from telephone office. I desire some arrangement by which I can, while at my residence, hear the ring or call on the call magneto bell at the office. 1. Can I attach an electric bell placed in my dwelling to the telephone line wire outside my office and thus catch the call? A. Yes, by cutting the wire and inserting a call adapted to the line. 2. What would such bell cost, and name of bell? A. It is probable a bell with a polarized armature would be required. You can obtain particulars by addressing electricians who advertise in our columns. 3. Would an extra cell of battery be necessary? If so, what kind? A. If the call is made by means of a magneto machine a battery will not help you. We cannot give you practical advice without knowing more of the detail of your line.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

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AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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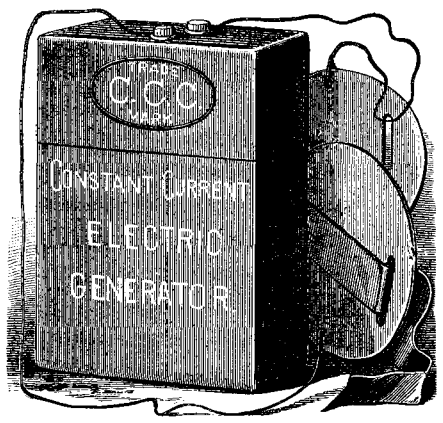

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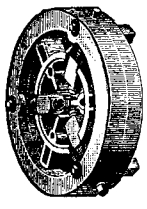

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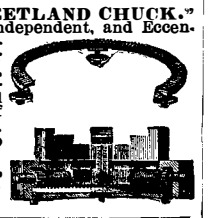

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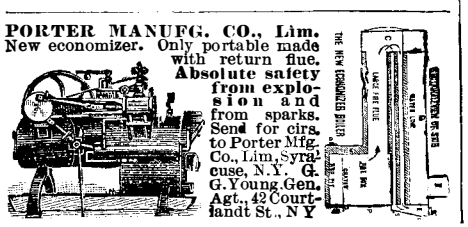

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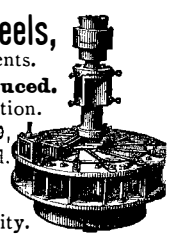

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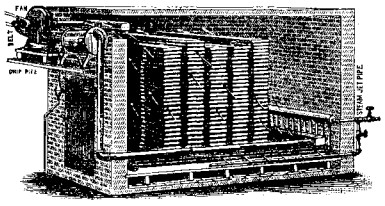

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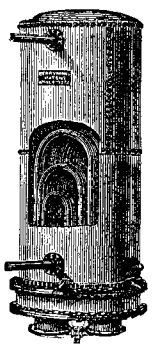

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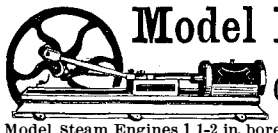

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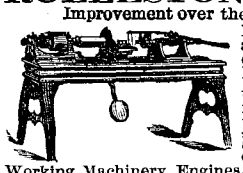

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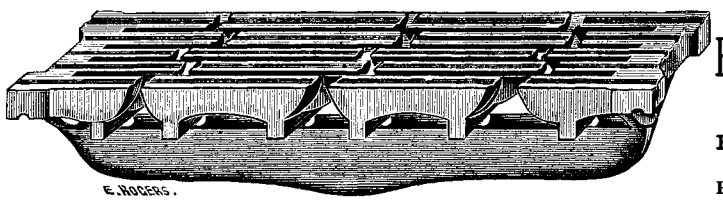

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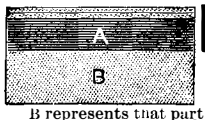

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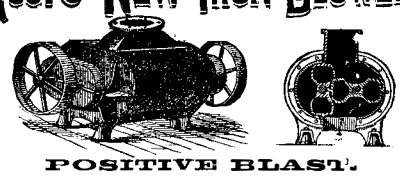

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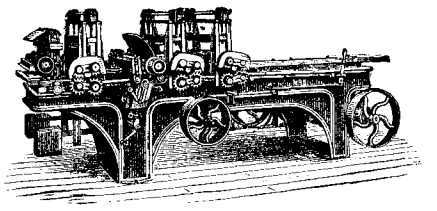

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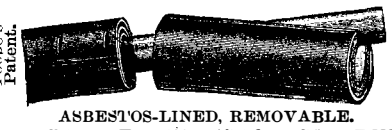

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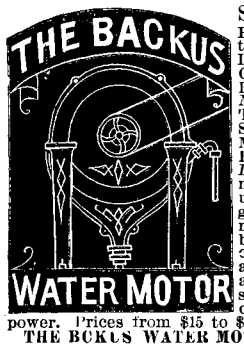

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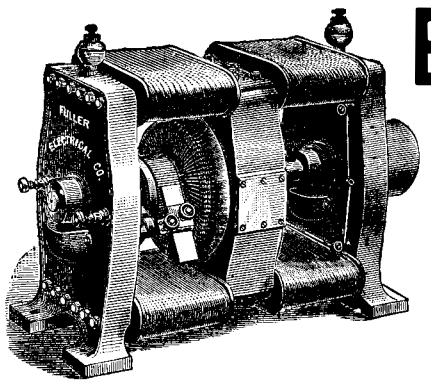

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PORTRAIT OF GEORGE ELIOT,

the only authorized portrait of the great novelist yet published or to be published, furnished by her husband, Mr. Cross, and reproduced from an etching made especially for this purpose by M. Paul Rajon. It accompanies a paper by Frederick W. Myers, who deals interestingly with George Eliot's religious and philosophical beliefs.

Mrs. BURNETT'S NEW NOVEL, "Through One Administration," a story of social and political life in Washington, begun in this number, is expected to rival in interest the writer's "That Lass o' Lowrie's," and "A Fair Barbarian."

MARK TWAIN contributes a complete short story, entitled "A Curious Experience."

Mary Hallock Foote furnishes an entertaining paper on

A DILIGENCE JOURNEY IN MEXICO,

With eight of her own illustrations, engraved by Cole, Closson, and others. An article on

IMPRESSIONS OF SHAKSPEREAN CHARACTERS,
By Tommaso Salvini, the eminent Italian Tragedian, will attract wide attention. There is also a paper on Salvini, with drawings of him in Othello and Macbeth.

"COSTUMES IN THE GREEK PLAY AT HARVARD,"

By Frank D. Millet, the artist who designed the costumes for the play, includes seventeen striking illustrations by Brennan. An opportunity for reproducing seven magnificent paintings is afforded by a paper on the artists **FORTUNY AND REGNAULT.**

"Around Cape Ann" is a breezy 'longshore article illustrated with nine exquisite reproductions of etchings by Stephen Parrish.

"MY ESCAPE FROM SLAVERY," By Frederick Douglass,

Is a paper of historical value and interest. W. J. Stillman has an interesting article, with twenty-five illustrations, on the discovery and origin of **"The So-called Venus of Melos" (Milo).**

There is a capital short story by the author of "The Village Convict" (in the August SCRIBNER); an article by a Cunard captain on "Compulsory Lane Routes in the North Atlantic;"

POEMS BY
James Russell Lowell, Edmund Clarence Stedman, Edmund W. Gosse, Austin Dobson, Mary Mapes Dodge, Richard Watson Gilder, and others.

"Topics of the Time" contains contributions from the pen of the late Dr. Holland on the change in the name of the magazine, on "The Contingency of 'Inability,'" and "Public Spirit." This November number contains the year's prospectus.

The following is a summary of some of the

LEADING FEATURES FOR THE COMING YEAR,
In addition to Mrs. Burnett's new novel:

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THE EDITORIAL DEPARTMENTS will be unusually complete. Reviews of the best and most significant books will be continued. "Home and Society" will have a wider range of subject, and "The World's Work" is so frequently the source of quotation by scientific and industrial journals that its enlargement seems to be demanded.

The price of THE CENTURY MAGAZINE will remain at $4.00 per year (35 cents a number). The portrait of the late Dr. Holland, photographed from a life-size picture by Wyatt Eaton, and issued just before his death, will possess a new interest to the readers of this magazine. It is offered at $5.00 retail, or together with THE CENTURY MAGAZINE for $6.50. Subscriptions are taken by the publishers and by booksellers and newsdealers everywhere.

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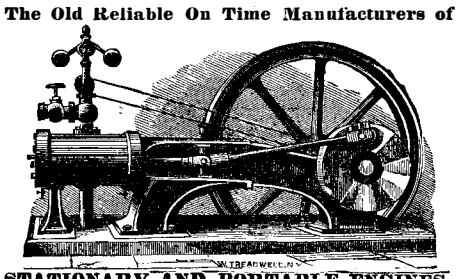

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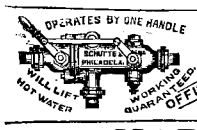

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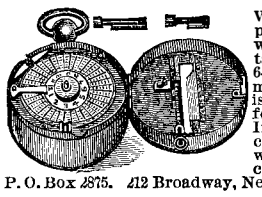

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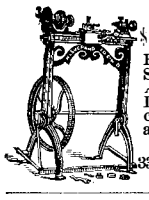

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